BIOLOGICAL ASSESSMENT

For

Snake River Fall Chinook Salmon

Snake River Spring/Summer Chinook Salmon

Snake River Steelhead Trout

Columbia River Bull Trout

Essential Fish Habitat

Windy Shingle Project

U.S. Department of Agriculture

Forest Service

Nez Perce-Clearwater National Forests

/s/ Tim Price **Date: September 6,** ***2017***

Nez Perce- Clearwater National Forests
Fisheries Biologist

I. INTRODUCTION

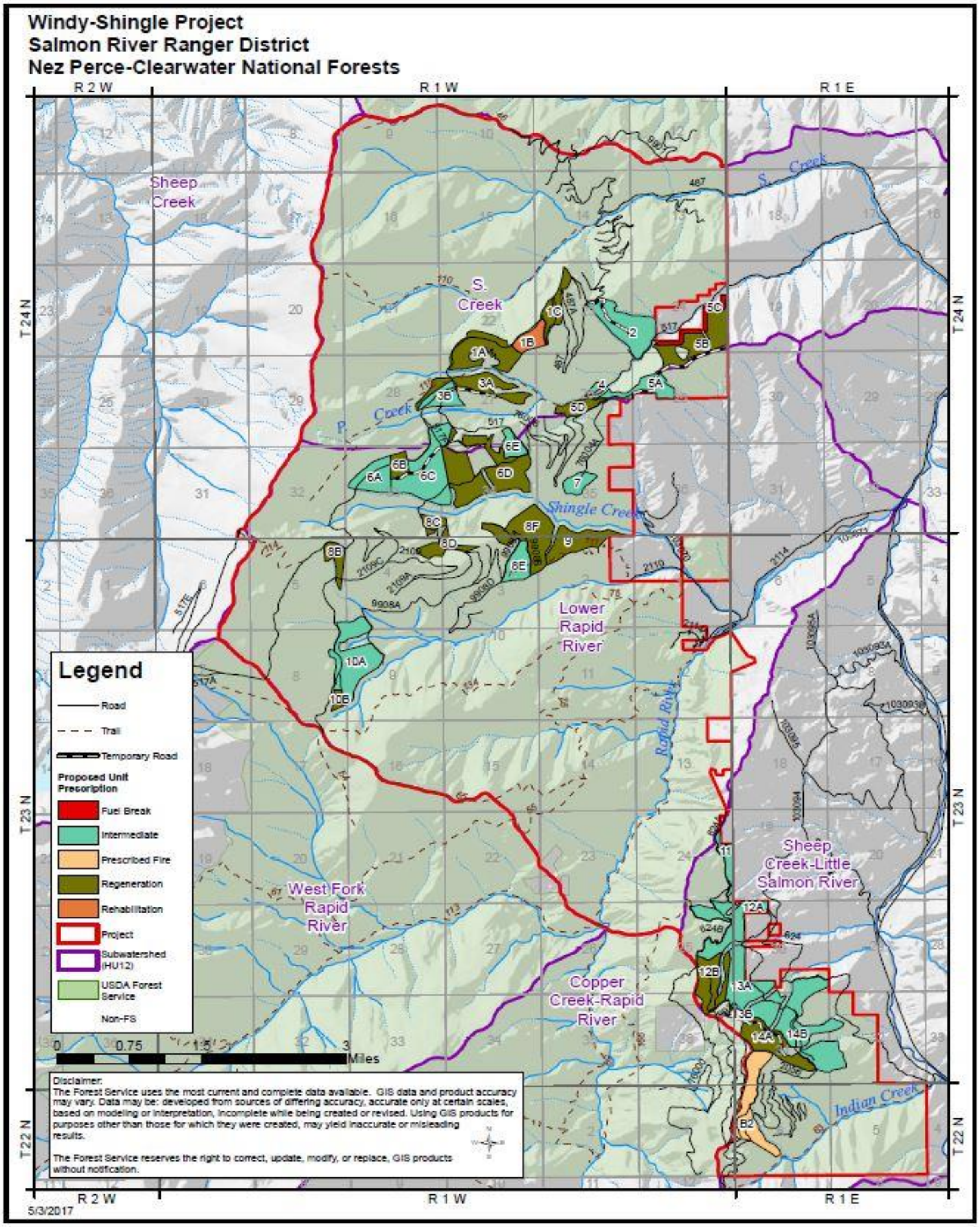
This project occurs on the Salmon River Ranger District, Nez Perce-Clearwater National Forests. Project activities and locations are enumerated and shown below in table 1 and map1.

The Endangered Species Act of 1973 directs federal agencies to conserve Endangered and Threatened Species and to ensure that federal actions authorized, funded, and carried out are not likely to jeopardize their continued existence or result in the destruction or adverse modification of critical habitat. In response to Section 7(c) of the Endangered Species Act and Forest Service Manual (FSM) 2670, this biological assessment displays the potential effects of conducting vegetation treatments and road management upon Threatened and Endangered Species that are known or may occur in the project areas.

The US Fish and Wildlife Service species list accessed on September 15, 2016 *(https://ecos.fws.gov/ipac/)* identified bull trout as the only threatened resident fish species under the ESA within Idaho. The NOAA Fisheries list was accessed on the same date and identified Snake River steelhead trout and both spring- and fall-run Snake River Chinook salmon as threatened under ESA (*http://www.nmfs.noaa.gov/pr/pdfs/species/esa_table.pdf*). In accordance with applicable requirements of section 305(b) of the Magnuson-Stevens Act and its implementing regulations (50 CFR Part 600.920), the Forest needs to evaluate potential effects of the proposed projects on these species. Essential Fish Habitat (EFH) for salmon also occurs within the project area and must be considered. Consultation with the two agencies is required for projects affecting these species.

Project Area Boundary, Location and Proposed Vegetation Treatments

Map 1 Location of the Project and Proposed Treatments



II. PROPOSED ACTIONS

The Windy Shingle Project (Project) is being implemented to achieve forest restoration and resiliency objectives on National Forest lands near Riggins Idaho. The purpose of the Project is to increase forest resilience to insects and disease and to reduce wildfire risk to properties adjacent to National Forest lands. It is projected that the project may be implemented roughly between 2018 and 2022. The inwater work window would occur from July 15 to August 15 in any given year.

All work will be designed comply with or exceed protections afforded by the Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code) and the Forest Service Soil and Water Conservation Practices Handbook 2509.22 to prevent harvest-created sediment from being delivered to streams in the project area.

Table 1: Summary of Preliminary Proposed Vegetation Management Activities

Proposed Vegetation Management Activity	**Acres**
Fuel Break	29
Regeneration Harvest (Mechanical)	1,045
Regeneration Harvest (Helicopter)	212
Intermediate Harvest	1,348
Rehabilitation (Fuels Reduction without commercial harvest)	44
Prescribed Burning	126
TOTAL	**2,804**
Road Management Activities	**Miles**
Road Maintenance Proposed	41
Road improvement Proposed	21.6
Road Decommissioning Proposed	5.6
New temporary road construction Proposed	3.9
TOTAL	72

Regeneration harvest: The proposed vegetation management activities include approximately 1,257 acres of regeneration harvest designed/intended to address forest health issues including insect, disease and fire hazard. Of the proposed 1257 acres of regeneration harvest 212 acres is planned to be removed using a helicopter. Typicaly there is verly little gorund disturbance with helicopter loging.

Within regenerated areas, irregularly spaced live and dead trees as well as pockets, stringers (connecting patches of trees) and islands of untreated vegetation would be retained to provide wildlife habitat, maintain visual quality, provide shelter for seedlings, provide a seed source for natural regeneration, and contribute woody debris for long-term site productivity.

After harvest is completed, slash and pre-existing natural fuels would be broadcast burned under controlled conditions. This would reduce fuel loading, recycle forest nutrients, and create favorable sites for the establishment of western larch and/or ponderosa pine. Site preparation and/or fuels treatment may include a combination of prescribed burning, grapple piling, and hand piling, depending on post-cutting conditions. Mechanical piling of fuels may occur as needed prior to burning along property boundaries, open roads, leave areas, and some control lines to reduce risk and achieve prescribed fire objectives.

Following burning, open areas would be planted with western larch and ponderosa pine seedlings. Both seed from leave trees and the sprouting of hardwoods would contribute additional diversity to the newly established stands. The composition and structure of these stands would afford them resilience and resistance to insects, disease and fire, both in the short term, and as the trees grow and mature.

The size of the proposed regeneration units reflects the extent and scope of declining forest health and increasing fire hazard in the project area. Openings over 40 acres may result from the regeneration treatments and prescribed burning with units ranging in size from approximately five to 200 acres. Following treatment, the size of open, early seral vegetation patches within the project area may be better aligned with the range of historic variability and would also result in large areas of reduced fire hazard. Within these regenerated areas, green retention trees, snags and coarse wood would be present. In addition, a new generation of desirable, potentially long-lived, early seral tree species including larch and ponderosa pine would be established. Conditions in these areas would resemble those that were common in the project area prior to in the 20th century.

Intermediate Harvest: The proposed action includes 1,348 acres of intermediate treatments including thinning and improvement harvests. This type of treatment would remove trees in areas where there is the opportunity to maintain or enhance the growth of western larch or ponderosa pine and move stands towards desired structural stages. The trees selected for removal would generally be smaller or less dominant in the stand. They would also be species not desired for future stand composition, or diseased or dead trees that are not needed to meet future stand objectives. The removal of these trees would provide growing space for the remaining trees. These stands would generally not be open enough to allow for the successful establishment of seedlings of desired species. Depending upon site conditions and tree species left after treatment, fuel hazard would be reduced by use of fire or mechanical methods as appropriate.

Rehabilitation treatment: Would be utilized in areas where there are already large openings created by root disease and insect attack. This treatment would involve slashing small, undesirable trees followed by prescribed burning and reforestation with desirable species on 44 acres.

Fuel Breaks: Fuel breaks are areas where dead, diseased and dying trees and small-diameter live trees, and brush, are removed by hand with chainsaws. The goal is to reduce the connectivity of vertical and horizontal fuels by felling trees and brush, cutting them into lengths, and piling of the material, which is then burned in place in early spring or late fall. This treatment is proposed on approximately 29 acres. Fuel breaks would be created along some private land boundaries in the area of Road 517 in Unit 5. The fuel breaks would act to slow advancing fires and provide firefighters and the public with improved ingress and egress opportunities in the event of a wildfire. It is anticipated that fuel break width will be approximately 200 feet, but the exact width would be determined on a site-specific basis taking into account slope, stand density and fuel loading. The thinning of larger live trees with in the 200 foot buffer would potentially occur during commercial harvest in Unit 5. Landslide prone areas found as inclusions in other units may also be treated as fuel breaks to manage fuel loading without commercial harvest.

Underburning (Prescribed Burning): Underburning on 126 acres without harvest involves deliberately introducing fire to a forested area without any prior modification of stand structure. This treatment is proposed in areas with desirable, fire-resistant species. This type of burning is low intensity and is intended to consume surface fuels and ladder fuels, not the overstory canopy. Ignition in for under-burning would be done slowly to allow for survival of the overstory. The units where this is proposed are primarily comprised of open ponderosa pine and Douglas-fir with a grassy understory. The 126 Acre prscribed burning unit is near the top of a ridge (see unit B2 on figure 1). No perenial or intermittant streams are found in or near the unit so essentially there would be no PACFISH buffer associated with in this 126 acre unit.

Road management: Activities are needed to implement the project (e.g. maintenance, reconditioning, reconstruction, temporary road construction). Approximately 3.9 miles of temporary road is proposed. These temporary roads must be decommissioned no later than three years after project completion. No permanent roads would be constructed.

Sediment Reducing Watershed Improvement: As part of the proposed action roads would be either be improved, receive road maintenance treatments or would be permanently decommissioned. 20.6 miles of road would be improved, 41 miles of road would be receive road maintenance treatments and over 5.6 miles of road would be decommissioned using full re-contouring and soil stabilizing native seeding where applicable to establish long term hydrologic stability and productivity. Road improvements can be more extensive than maintenance and are necessary to bring roads up to a safe standard for log haul and vehicular passage as well as to minimize surface erosion and provide proper or improved drainage. The results of this work would improve overall water quality within the project area streams and would help to continue upward trends in terms of forest plan fish habitat objectives and stream water quality long term. The proposed road work greatly reduces potential for sedimentation and/or erosion and rutting from roads, could reduce the risk of road or culvert failure, and would likely improve existing watershed conditions and water quality to project area streams.

Proposed Road Treatment Explanations Road/stream crossings can also be a major source of sediment to streams resulting from channel fill around culverts and subsequent road crossing failures (Furniss and others 1991). Plugged culverts and fill slope failures are frequent and often lead to catastrophic increases in stream channel sediment, especially on old abandoned or unmaintained roads (Weaver and others 1987).

- Road Maintenance: Road maintenance is typically performed on roads used for harvest activities and log haul to minimize erosion and provide proper drainage. The existing templates of the road are typically safely passable by vehicles and require little work for safe log haul. Road maintenance work consists of surface reshaping and blading, typically light roadside brushing, installation of drainage dips and ditch, repairing small slides and slumps and culvert maintenance. Surface reshaping, installation of drainage dips and functioning ditches and repairing small slides and slumps and culvert maintenance can greatly reduce potential for sedimentation and/or erosion and rutting from roads and would likely improve existing watershed conditions and water quality to project area streams. Cleaning of ditches will only be done where it will reduce potential for erosion and damage to road beds.

- Road Improvements: Road improvements are typically performed on roads that require more work than road maintenance to bring up to a safe standard for log haul and vehicular passage. Roads that require improvements may have some drainage and slope/sluff issues that make passage difficult. These roads may also have thicker vegetation on the shoulders or growing within the road prism. Activities may include grading and shaping of the road surface, cleaning and reshaping ditches, catch basins and culvert inlets/outlets to achieve positive drainage; replacement or new installations of culverts, repairing soft or unstable roadbed, roadside brushing or clearing and grubbing, minor cut slope and fill slope stabilization, surface gravel placement, and surface compaction. Road improvements typically consist of spot fixes to address existing or potential erosional issues. Improving drainage (proper sized crossing culverts and added dips) and unstable road bed can reduce potential for road failure, sedimentation, erosion and rutting.

- Road Decommissioning: Road decommissioning can be done in two ways, through road obliteration or abandonment. Descriptions of each are as follows.

    - Road obliteration would include recontouring of the road template. No road obliteation would occur in or near fish berring streams. All perennial and intermittent stream channel crossings (culverts) would be removed. Disturbed soils would be revegetated with local native transplants and/or seed. Decommissioning roads by obliteration would directly improve soil conditions by decompacting soils and adding wood and other organic matter to the existing road surface. Slope stability and hydrologic function would improve, reducing the potential risk of mass erosion from culvert or fill failures.
    - If a road is currently revegetated and stable with no culverts, it may be abandoned. Roads proposed for decommissioning by abandonment are often ridgetop roads on gentle slopes with few, if any, culverts and where road surveys show existing hydrological stability and minimal risk of soil erosion or mass failure. These roads generally have a narrow disturbed width, have adequate plant and organic cover, and have cut and fill slopes of no more than two feet in height. Abandonment would leave the road in place but inaccessible to any vehicle use and would eventually become naturally rehabilitated.

Regeneration Harvest and Openings Greater than 40 Acres

It is desired to trend the forests in the Windy Shingle project area toward early seral tree species that are less susceptible to root disease fungi and thus decrease the amount of tree mortality occurring. To achieve this desired condition a combination of even-aged and two-aged silvicultural systems are being proposed for some stands. Reforestation of these units is required to occur within 5 years of the unit being harvested. Regeneration harvest is the preferred treatment for some stands for the following reasons:

The project area is deficient in stands dominated by early seral species, compared to historic conditions. Stands identified for regeneration harvest are dominated by late seral species (grand fir, Douglas-fir, mountain hemlock) that are susceptible to and experiencing root diseases and insects. Stands are older and existing stand structure is breaking apart, not regenerating to early seral species and creating an unacceptable/undesirable fuel load.

It is also desired that regeneration harvests create a variety of patch sizes and stand structures that break up the current uniform and simplified landscape pattern. Increasing the diversity of patch sizes, stand structures and species compositions will increase the resiliency of forest stands to insects and diseases and decrease the risk of very large wildfire. To create a variety of patch sizes some of the proposed regeneration harvest activities would result in openings greater than 40 acres. As further discussed in the Vegetation Report these opening sizes require Regional Forester approval (FSM 2471.1).

III. Design Elements and BMPs

The following BMPs and design elements are would be implemented to ensure compliance with the regulatory framework for water quality and the aquatics resource and/or to reduce the risk of adverse impacts to the aquatics resource. A description is provided as to when, where and how the design element should be applied and/or what conditions would trigger the need to apply the design element.

> Use of BMPs, as found in Rules Pertaining to the Idaho Forest Practices Act, will be applied to prevent non-channelized sediment delivery from harvest units and roads to streams in the project area (Table 2).

Anticipated Effectiveness: Highly effective. BMPs would be followed for the proposed action as stipulated by the Idaho Forest Practices Act. Idaho water quality standards regulate non-point source pollution from timber management and road reconstruction activities through the application of BMPs. The Region 1 and Nez Perce/Clearwater National Forest has an excellent record of successful implementation of effective BMPs (IDEQ 2013 and 2016 Interagency Forest Practices Act Audit). Between 1990 and 2002, the Forest had a BMP implementation rate of 98% and a 97.8% rate of effectiveness (USDA Forest Service, 2003). Survey results from 2004 through 2008 indicate implementation and effectiveness rates of 98% or greater (these reports can be found on the world-wide-web at):
http://www.fs.usda.gov/detail/nezperceclearwater/landmanagement/planning/?cid=stelprdb5408439).
The same BMPs would be applied to the Windy Shingle Project and are expected to have similar results. In addition, tree tops and limbs cut from the harvested trees would remain within the unit and would provide downed woody material that would help trap sediment moving downslope.

1. PACFISH default buffers will be used to define vegetation treatment unit boundaries. No harvest will occur within 300 feet of fish-bearing streams, 150 feet of perennial non-fish bearing water, 100 feet of intermittent streams, and 150-foot slope distance from the edge of wetlands, seeps and spring larger than one acre or verified landslide prone areas and 100-foot slope distance from the edge of wetlands, seeps and springs less than one acre or verified landslide prone areas

Anticipated Effectiveness: Highly effective. "Riparian Habitat Conservation Areas are portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. Riparian Habitat Conservation Areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1). Influencing the delivery of coarse sediment, organic matter, and woody debris to streams, 2) Providing root strength for channel stability, 3) Shading the stream, and 4) Protecting water quality (Naiman et al. 1992)."

Past monitoring efforts and current literature (Sweeny and Newbold 2014) show that the application of vegetative buffers around aquatic dependent ecosystems are effective at maintaining ecological processes for aquatic ecosystems.

Preliminary monitoring results from the PACFISH/INFISH Biological Opinion (PIBO) monitoring across the Upper Columbia River Basin indicate improving trends in pool depth, bank stability, large wood frequency and volume, and the presence of spawning substrate (<3 inches in diameter) as a result of PACFISH implementation (USDA Forest Service 2009). Significant decreases in the percent of fine substrates in pool tailouts has also been observed in managed watersheds. PIBO results for the Salmon River showed that managed areas had similar habitat complexity as those in unmanaged watersheds (Archer et al, 2016; Meredith, 2013).

Local monitoring of 23 miles of RHCAs and 5.5 miles of temporary road after timber harvest and burning of the units was completed on the Lochsa District in 2014 (USDA Forest Service, unpublished data). There was no evidence of sediment moving from harvest units into RHCAs or sediment moving from temporary roads (with no stream crossings) into harvest units or RHCAs. The thick vegetation that makes up RHCAs acts as an excellent, virtually impenetrable, filtering source for overland sediment flow. Retaining downed woody debris within the harvest units also provides structures that capture sediment and slow or stop its movement down the slope.

Other Required Design Elements and BMPs

Table 3. Project Design elements and/or BMPs for the Protection of Aquatic Species Habitat and Water Quality.

Soil Resources, Water Quality and Fish Habitat Protection	
	Harvest Activities
1.	PACFISH default buffers will be used to define vegetation treatment unit boundaries. No harvest will occur within 300 feet of fish-bearing streams, 150 feet of perennial non-fish bearing water, 100 feet of intermittent streams, and 150-foot slope distance from the edge of wetlands, seeps and spring larger than one acre or verified landslide prone areas and 100-foot slope distance from the edge of wetlands, seeps and springs less than one acre or verified landslide prone;
2.	No ground based skidding would be allowed on slopes over 35%;
3.	Work associated with the proposed action during wet conditions would cease if rutting, erosion, soil displacement damage cannot be controlled. The Sale Administrator will make the determination when condition warrant ceasing operations and/or haul. This standard also applies to winter logging and/or haul as well;
4.	Prior to leaving the site, any rutted areas and other damaged areas would be smoothed, sloped and graded to drain, and all erosion control features required would be constructed as functional. When working adjacent to live water or streams a buffer of vegetation, brush barrier, or straw dike would be maintained to prevent direct sedimentation to the stream;

5.	Tractor crossings over road ditchlines will be limited where possible, by installing temporary culverts or crossing logs. Ditch crossings, cut slopes, and fill slopes will be to standard after harvest. Sediment filtering devices such as straw bales will be used at disturbed ditch sites as needed to reduce erosion and sediment movement until the sites are repaired;
6.	To reduce erosion and maintain soil productivity 7-15 tons per acre of coarse woody debris (greater than or equal to 3 inches in diameter) would be retained following completion of activities. Reference "Coarse Woody Debris, Snag and Green Tree Retention Guidelines" (USDA 2008);
7.	Prior to harvest, skid trails, excavated skid trails, landings, and yarding corridors will be located to minimize the area of detrimental soil effects;
8.	Tractor skid trails will be spaced a minimum of 80 feet apart, except where they converge, and existing skid trails will be reused where practicable;
9.	Excavated skid trails will be recontoured and landings will be decompacted to restore slope hydrology and soil productivity;
10.	Site preparation, fuels treatment, and planting activities would occur within five years following timber harvest in regeneration units;
11.	Landings will be located outside of areas where channelized drainage (i.e., sediment transport) toward RHCAs could occur;
12.	Regeneration and rehabilitation treatment areas will be planted with a silviculturist approved native seedling mix to enhance natural reestablishment of tree stands;
Prescribed Fire	
13.	No prescribed fire ignition would occur on landslide prone areas;
14.	For the harvest units/site prep/fuels management burning ignition will not occur within RHCAs. However Fire may be allowed to creep into RHCAs under burning conditions where high fire severity or tree mortality could be limited and would not to retard the attainment of Riparian Management Objectives (RMO's) or substantial stream side shade;
15.	Guidelines found in NMFS' Anadromous Salmonid Passage Facility Design (NMFS 2011a) will be utilized for all water pumping activities associated with dust abatement and fire safety. A fisheries biologist will inspect all pumping locations;
Temporary Roads	
16.	Temporary roads would be located near ridge tops and/or along routes with no intermittent or perennial stream crossings;
17.	Following use, temporary roads will be obliterated within three years which would include decompaction, recontouring, and covering the soil with slash/organic debris cover;
18.	If roads are to be overwintered, they would be water-barred and placed into a hydrologically stable condition to minimize surface erosion potential;

Haul, Road Maintenance and Improvements	
19.	Haul routes would be maintained to BMP standards and would meet or exceed Idaho Forest Practices Act standards, including proper drainage, adequate stream culvert capacity, cleared and functional cross-drains;
20.	Roads that would be used for log hauling would receive maintenance or improvement treatments before haul begins;
21.	Prior to the start of the proposed road work and vegetation treatments and subsequent haul, additional or replacement crossdrains and/or rolling dips may be installed where direct road runoff and sediment could be directed to the forest floor, away from stream courses, which would minimize the potential for haul road contributing runoff and sediment to streams at stream crossings;
22.	When/if adding crossdrains (Culvert, waterbar, rolling dip, etc.) they would be spaced at approximately 100-200 feet on either side of stream crossings or where appropriate to best reduce potential for sedimentation;
23.	Roadside drainage ditches will only receive maintenance where needed to ensure proper drainage. Sediment filtering devices (e.g., wattles, weed-free straw bales, filter fences, etc.) will be used as needed to limit erosion and delivery of sediment from roads into streams;
24.	Culvert replacements would adhere to the Stream Crossing Programmatic conservation measures (NMFS No. 2011/05875) as detailed in the Road Decommissioning section below;
25.	During excessively wet periods, roads may be closed to operations, in order to prevent road damage, soil displacement and/or erosion. The Sale Administrator will make the determination when condition warrant ceasing operations and or haul. This standard also applies to winter haul as well;
26.	When working adjacent to water, i.e. culvert removal or drainage/culvert installation buffer of vegetation, brush barrier, or straw dike would be maintained in order to prevent direct sedimentation to the stream;
27.	Prior to leaving the site, any rutted areas and other damaged areas would be smoothed, sloped and graded to drain, and all erosion control features required would be constructed as functional;
28.	Magnesium Chloride or water will be used for dust abatement on major haul routes in order to increase safety, reduce road surface erosion, and minimize dust and sediment input to streams from log hauling activities;
29.	Dust abatement would be applied the same year that log hauling occurs. Application would follow design criteria in the NPCNF' Programmatic Road Maintenance consultation (1999) which specifies increased application rates may be used to enhance safety or to protect resources;
30.	With the application of Magnesium Chloride, a one-foot no-spray buffer would be applied on the edge of gravel if road width allows. When water is used, any water pumping sites would be approved by a fisheries biologist or hydrologist. The equipment used to remove water from the stream would meet NMFS screening criteria (NMFS 2011);

31.	Guidelines found in NMFS' Anadromous Salmonid Passage Facility Design (NMFS 2011a) will be utilized for all water pumping activities associated with dust abatement and fire safety. A fisheries biologist will inspect all pumping locations;
Road Decommissioning	
32.	Road decommissioning or culvert replacements would adhere to the Stream Crossing Programmatic conservation measures (NMFS No. 2011/05875). Measures to prevent damaging levels of sediment from entering streams would be undertaken during road decommissioning or culvert replacements. Measures may include: o installing temporary crossings over live streams if needed in order to access roads to be decommissioned o placing removable sediment traps below work areas to trap fines o when working instream, removing all fill around pipes prior to bypass and pipe removal; o revegetating scarified and disturbed soils with weed free grasses for short-term erosion protection and with shrubs and trees for long-term soil stability; o utilizing erosion control mats on stream channel slopes and slides; and o mulching with native material, where available, or using weed-free straw to ensure coverage of exposed soils; Re-contouring of stream channels would match the plan and profile of the stream above and below the road.
Equipment Fuel/Oil	
33.	Refueling of heavy equipment and fuel storage would occur outside of RHCAs. Fueling of logging trucks would occur in town/cities and not in the project area;
34.	If Purchaser maintains storage facilities for oil or oil products on Sale Area, Purchaser shall take appropriate preventive measures to ensure that any spill of such oil or oil products does not enter any stream or other waters of the United States or any of the individual States;
35.	If the total oil or oil products storage exceeds 1,320 gallons in containers of 55 gallons or greater, Purchaser shall prepare a Spill Prevention Control and Countermeasures Plan. Such plan shall meet applicable EPA requirements (40 CFR 112), including certification by a registered professional engineer;
36.	Purchaser shall notify Contracting Officer and appropriate agencies of all reportable (40 CFR 110) spills of oil or oil products on or in the vicinity of Sale Area that are caused by Purchaser's employees agents, contractors, Subcontractors, or their employees or agents, directly or indirectly, as a result of Purchaser's Operations. Purchaser will take whatever initial action may be safely accomplished to contain all spills;
37.	Gas cans (5 gallons) used for fueling chainsaws will also be stored and transported in pick-up trucks. In the event of on-site fuel storage, the provisions of the sanitation and servicing portion of the contract will be followed to minimize the risk of a fuel spill;
38.	Contract specifications included but are not limited to maintaining all equipment operating in the contract area in good repair and free of abnormal leakage of lubricants, fuel, coolants, and hydraulic fluid and contractors would be responsible for cleanup of any spill resulting in pollution of soil or water;

39.	For instream culvert work, all equipment used in the stream and in riparian areas will be cleaned of external oil, grease, dirt, and mud, and be free of abnormal leaks prior to arriving at the project site and contractors will have spill prevention and containment materials on site.

IV. DESCRIPTION OF THE AREA AND DIRECT/INDIRECT/CUMULATIVE EFFECTS

The proposed Windy-Shingle vegetation management project is located in Idaho County, Idaho. The northern extent of the project area is located approximately five miles west of Riggins. The southern extent of the proposed project area is located approximately three miles southwest of Pollack.

The project area boundary covers 23,000 acres. The 23,000 project area boundary constitutes 6.45% of the Little Salmon River drainage area. The combined proposed vegetation treatment areas (2804 acres) constitutes approximately .8% of Little Salmon River drainage. The proposed project area is located on National Forest System (NFS) lands in Township 24 North, Range 1 West, Sections 9-17, 20-29, 32-35; T23N, R1W, Sections 1-10, 12, 13, 24, 25, 36; T23N, R1E, Sections 7, 19, 30, 31, 32; T22N, R1W, Section 1; T22N, R1E, Sections 5, 6, Boise Meridian.

Perennial stream segments that have potential to be influenced by the proposed vegetation management (considering the scale of up-slope and/or adjacent activates) because they are in near, or adjacent proximity to the harvest or prescribed burning activities include the following four stream areas/segments (see map below as well):

1. South Fork Squaw Creek headwaters to South Fork Squaw Creek at T24N, R1W, NE corner of section 22;
2. Papoose Creek headwaters to Papoose Creek at T24N, R1W, E corner of section 24;
3. South Fork Shingle Creek headwaters to South Fork Shingle Creek at T23N, R1W, NE corner of section 9.
4. Shingle Creek headwaters to Shingle Creek at T24N, R1W, SE corner of Section the SE edge of section 35;
5. Indian Creek headwaters to Indian Creek at T22N R1E SE corner of Section 9;

No non-Forest Service lands exist within the proposed project area. The project area is adjacent to privately managed lands, and lands managed by the Wallowa-Whitman National Forest in Hells Canyon Wilderness; Idaho Department of Lands; Bureau of Land Management; and Idaho Department of Lands. No activities are proposed directly on private lands.

Analysis Methodology

Recent stream habitat surveys from 2016 were used to assess stream/fish habitat conditions and/or trends, stream channel resiliency and stability for maintenance of habitat and also determine if instream conditions meet Forest Plan direction and to determine compliance with Forest Plan Fishery/Water Quality objectives. Forest service fish sampling records were used to produce fish species distribution mapping along with critical and/or essential fish habitat mapping, NOAA Habitat Mapping and USFWS

Habitat Mapping used to determine habitat usage and proximity to activities. Recent field reviews (2016) were also conducted to evaluate general stream, road, and culvert conditions and water quality improvement opportunities areas in Shingle Creek, Squaw Creek, Papoose Creek and Indian Creek watersheds.

Focused road surveys were conducted in 2016 in order to identify and assess stream crossings, existing drainage structures, and potential drainage needs along roads near streams. General road conditions between crossings were noted and any problems with drainage were identified. Field survey notes of roads proposed for decommissioning were reviewed to assess crossings to be removed.

GIS information, spatial information, Google Earth imagery (2016) in combination with field surveys, historic information, monitoring data, information from the hydrology analysis and other specialist reports along with other best available science and literature and were used to assess conditions in the project area related to roads, water quality and fish habitat. This includes data from Forest Plan monitoring as well as PACFISH/INFISH Biological Opinion (PIBO) monitoring data collected.

FISHSED Modeling

The Forest Plan requires the use of the cobble embeddedness indicator in order to determine whether or not a Forest Plan prescription watershed meets its fishery water quality objective as shown in Appendix A of the Forest Plan. The model considers project effects on aquatic habitat as it relates to fish productivity (i.e. habitat capacity). Cobble embeddedness is a measure of how the rocks in the stream are surrounded, or embedded by, small materials such as silt or sand. Estimates, based on 2016 field data of existing cobble embeddedness in project area streams, combined with NEZSED outputs for peak sediment yield (see Hydrology/Soils report for more information regarding the NEZSED model and outputs), and was used to predict changes in summer and winter rearing carrying capacities for trout and salmon using the FISHSED model (Stowell et al. 1983). The inherent application of NEZSED results is to compare proposed project alternatives, and estimates should not be considered absolute values. NEZSED is not intended to produce definitive sediment routing predictions as the model does not account for site specific erosion control and sediment reducing design elements and BMPs. The NEZSED model is structured as if all actions were being implemented concurrently. In reality, actions would be spread out over the span of 5 years. NEZSED does not account for improvements to roads, which are proposed, that would likely lead to a reduction in sediment in the short and long term over the existing condition therefore these situations will be discussed qualitatively when describing potential effects of sedimentation.

Furthermore, required design measures, BMPs and RHCAs, which also cannot be modeled with NEZSED, have been shown through local and regional monitoring and studies to be highly effective in reducing erosion and sedimentation despite the predictions of models. The Soil and Water Conservation Practices (SWCP) Handbook (FSH 2509.22 USDA 1988) outlines BMP that protect soil and water which meet or exceed Idaho Forest Practices, Rules, and Regulations.

Mitigation measures are designed to eliminate or reduce to acceptable levels the effects of proposed activities, and design measures are aimed at avoiding specific resource issues. A majority of these are derived from site specific BMPs from the Idaho Forest Practices Act and Stream Channel Alteration Handbook, with comparable practices from the FS R1/R4 SWCP Handbook.

The model is run at the Forest Plan "prescription watershed" level only. Only applicable prescription watersheds as shown in Appendix A of the Forest Plan were analyzed in detail. The basic model assumption is that an inverse relationship exists between the amount of fine sediment in spawning and rearing habitats and fish survival and abundance. In general, when sediment yields are increased over natural rates, especially on a sustained basis, fish biomass can decrease (Bjornn et al. 1977). FISHSED is most appropriately used to assess the effects of changes in habitat quality when cobble embeddedness changes are modeled to be greater than 10% (Stowell et al. 1983). The FISHSED model is only useful for comparing alternatives (Conroy and Thompson, 2011) and is not designed to predict actual sediment levels. FISHSED calculations and additional information about the model, including assumptions, are in the project file.

Existing Conditions

The information provided in this report includes only the streams located within or in proximity to the 24,000 acre project area. The project area boundary containing the proposed activities includes segments of Squaw Creek, Shingle Creek, and Indian Creek and Papoose Creek. The segments of these streams found within the project area also constitutes the corresponding Forest Plan prescription watersheds. The existing condition and potential effects to these drainages are the focus of this assessment because they are adjacent and or in proximity to the proposed activities and therefore may be affected. Furthermore these stream segments and prescription watersheds were selected to be analyzed because stream segments beyond or outside of the project area boundary would have diluted effects from proposed action to the point where they would not be discernable.

Existing stream channel conditions assessments where based on recent field survey and data information, district files, GIS information and data, professional experience as well as literature. These stream were chosen to discuss in detail because they are the major streams that have potential for or documented as containing aquatic species habitat within or near the proposed activity areas.

General Project Area Conditions

All of the prescription watersheds (other than Indian Creek) are drained by cool clean water of relatively unroaded and secure headwaters that fall within the "back county restoration" or "wildland recreation" designated areas of the Salmon Face and Rapid River Idaho roadless areas. There are approximately 25 perennial and 44 intermittent road/stream crossings within the project area.

The existing project area road density (includes open and/or non-stored roads within all the project area prescription watersheds regardless of applicability) is about 2 mi/mi^2; rated "Moderate" (NOAA1998). The existing project area road density within the Riparian Habitat Conservation Area(s) (RHCA) (within 50-300 feet of a stream), is <1 mi/ mi^2; rated as "High" (good).

There are approximately 22 miles of perennial (not including the Rapid River) and approximately 24 miles of intermittently flowing stream within the project area. The majority of the streams within the project area are 1st and 2nd order streams that are higher gradient Rosgen B/A type channels with forested riparian areas with almost all stream gradients greater than 2% slope.

Past timber harvest (forest canopy openings) in the project area mostly occurred between 1966 and 1996 with no known riparian area harvest. There are no known currently active in-channel mining areas within the project area.

No streams within the project area are 303d listed for sediment or temperature concerns and no sediment or temperature TMDL's exist for the project area streams. All streams are considered to be fully supporting beneficial uses. In general stream bank areas had high percentages of bank stabilizing cover according to Idaho DEQ surveys.

Squaw Creek

2016 Pfankuch Stream Channel Stability surveys indicate that the main stem of Squaw Creek is in good condition throughout the upper and lower reaches. Riparian areas are dominated by vigorously growing riparian/floodplain vegetation which includes abundant levels of densely rooted trees and vegetation. The trees provide good potential for future woody debris recruitment. Stream banks were noted as generally stable due to the dense vegetation and the stream channel contained abundant instream woody debris. Stream beds were stable with no indication of excessive deposition or erosion and instream woody debris was abundant.

On average the main stem of Squaw Creek is about 15 feet wide at normal high flows with an average floodplain width of about 40 feet. Stream gradients range from about 3-8%. Substrate is mostly a mix of boulders and cobbles with minimal fine sediment material. Squaw Creek is generally considered to be a Rosgen B/A type channel that are typically considered to be stable and resilient stream channel forms with lower potential for aggradation/degradation. Bedform morphology which creates natural debris constrictions help to create scour pools where finer material can be stored in the slower/deeper zones. This channel type contains cobble, gravel and bolder bed materials that are more impervious to effects from flow fluctuations/increases than lower gradient channels with finer bedload materials (Grant 2008).

Squaw Creek has relatively small accumulations of fine sand and other particulates. The accumulation of fine sand around cobble and larger gravels is called "cobble embeddedness." Cobble embeddedness in Squaw Creek was 17% in 2016. This equates to a fishery objective of 90% (Espinosa, 1992). This stream meets its Forest Plan objective of an 80% fishery objective and is likely trending upward in terms of water quality and fish habitat based on the field survey results and observed condition as shown in figure 1 and 2. This may be due to the continued maintenance (over the past 22+ years) of the riparian PACFISH buffers that provide wood recruitment and vegetative stream bank structure and stability (figure 1). This can result in deeper pools, decreased flow velocity and reduced stream bank erosion and sedimentation potential. Squaw Creek is a perennial fish bearing stream.

The existing watershed road density within Squaw Creek "prescription watershed" is about 1.5 mi/mi^2; rated in "moderate" condition (NOAA1998) and RHCA road density is rated as "high" or in a good condition at <1 mi/ mi^2.

Figure 1. Squaw Creek Main Stem Photo Displaying Abundant Riparian Vegetation, Stable Stream Banks and Channel Bed and Instream Woody Debris

Figure 2. Squaw Creek Typical Main Stem Photo Displaying Abundant Riparian Vegetation, Stable Stream Banks and Channel Bed and Instream Woody Debris and Good Fish Habitat

Papoose Creek (flows into Squaw Creek)

2016 Pfankuch Stream Channel Stability surveys indicate that the lower reach of Papoose Creek is in fair condition. Survey results indicate stream banks are moderately stable with vigorous riparian/floodplain vegetation and abundant levels of a mix of deep and densely rooted and trees and vegetation in some areas. Stream banks showed some areas of instability as indicated by some sediment deposition (Figure 3). Sections of lower Papoose Creek are intermittent and goes subsurface naturally, given the natural geology, during dryer months of the year (see Hydrology/Soils report for more information).

The Upper Reach of Papoose Creek was rated as in good condition. Survey results indicated that Upper Papoose Creek stream banks are stable with vigorous riparian/floodplain vegetation and abundant levels of a mix of deep and densely rooted and trees and vegetation. Stream banks were noted as generally stable the stream channel contained abundant instream woody debris: with minimal areas of instability or signs of deposition or erosion (Figure 4).

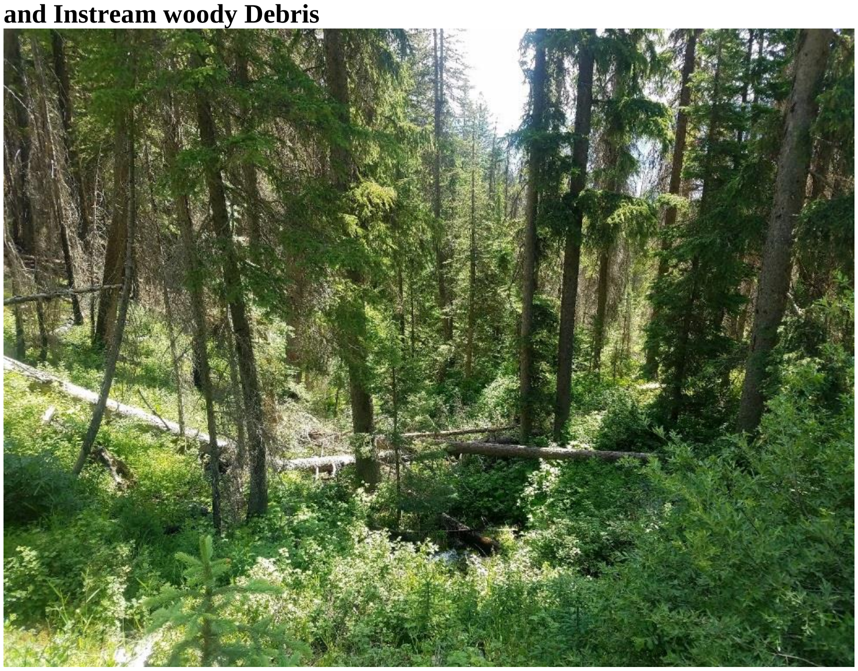
Papoose Creek is about 10 feet wide at normal high flows with an average floodplain width of about 15 feet. Stream gradients range from about 3-15%. Substrate is mostly a mix of cobbles, gravels and higher levels of fine sediment material in the lower reach and a mix of cobbles and boulders with a lesser component fine sediment material in the upper reach. Like Squaw Creek, Papoose Creek is a stable Rosgen B/A type channel which is more impervious to effects from water yield increases that lower gradient channels with finer bedload materials (Grant 2008).

Papoose Creek is a non-fish bearing intermittent stream (goes subsurface naturally) in the lower reach and is a perennial non-fish bearing stream in the upper reach however it provides cool water to Squaw Creek downstream. Papoose Creek is likely, currently, slowly trending upward in terms of water quality. This contention is based on the field survey results as well as observed conditions (Figure 3 and 4) resulting from a lack of harvest in riparian areas and retention of vegetation on and near stream banks. This stream is also drained by cool, clean water from relatively unroaded and secure headwaters that fall within the Salmon River Face "backcountry restoration designated area under the Idaho Roadless Rule".

The existing watershed road density within Papoose Creek "prescription watershed" is about 1.5 mi/mi^2; rated in a "moderate" condition (NOAA1998) and RHCA road densities are <1 mi/ mi^2; rated as "high" or good condition.

Figure 3. Lower Papoose Creek Lower Reach Typical Photo Indicating Past Deposition of Fine Material that is Becoming Vegetated and Stabilized

Figure 4. Upper Papoose Creek Typical Photo Well Vegetated, High Gradient and Stabilized Stream Channel and Instream woody Debris



Shingle Creek

2016 Pfankuch Stream Channel Stability surveys indicate that the main stem of Shingle Creek is in good condition. Stream banks are stable with vigorous riparian/floodplain vegetation and abundant levels of densely rooted trees and vegetation which indicates good potential for future woody debris recruitment. Stream banks were generally stable. Stream beds were stable and there was no indication of excessive deposition or erosion throughout the main stem (see figure 5 and 6).

The Shingle Creek mainstem is about 15 feet wide at normal high flows with an average floodplain width of about 20 feet. Stream gradients range from about 4-10%. Substrate is mostly a mix of boulders and cobbles with a lesser component fine sediment material. Like Squaw and Papoose Creeks, Shingle Creek is also a Rosgen B/A type channel which is more impervious to effects from water yield increases that lower gradient channels with finer bedload materials (Grant 2008).

Cobble embeddedness in Shingle Creek was 15% in 2016. This equates to a fishery objective of near 100% (Espinosa, 1992). The stream meets its Forest Plan objective of 80% due to the continued maintenance of the riparian PACFISH buffers and a lack of activities within riparian areas and because this stream is drained by cool clean water of relatively unroaded and secure headwaters. Shingle Creek mainstem is a perennial fish bearing stream.

The existing road density within Shingle Creek "prescription watershed" is about 2.3 mi/mi^2; rated in a "moderate" condition (NOAA1998) and RHCA road densities are. <1 mi/ mi^2 or in a "high" (good) condition.

Figure 5. Shingle Creek Typical Photo Well Vegetated and Stabilized Stream Channel and Stable Channel Bed Material

Figure 6. Shingle Creek Typical Photo Well Vegetated and Stabilized Stream Channel and Stable Channel Bed Material

Aquatic Habitats, Species and Distribution
Habitat for fish and aquatic species, on the Forest, benefits from relatively pristine headwater reaches which generally become less pristine downstream and nearer the Forest boundary.

A section of the Rapid River flows through the project area. Although it contains habitat for ESA-listed species bull trout, steelhead and spring chinook, no activities are proposed within this prescription watershed. Intermittent/ephemeral face drainages and Indian Creek flow out of the project area and into the Little Salmon River. The Little Salmon River contains habitat for ESA-listed bull trout, steelhead and spring chinook but are disconnected from potential influences of the proposed activities in the area by over a mile.

Papoose Creek and Indian Creek which are mostly within the project area are non-fish bearing due to small drainage size, steep stream gradients, intermittent stream flows or a combination of those factors. Natural fish barriers are generally extended sections of high gradient stream channel which limits fish habitat in upper Squaw and Shingle Creeks. These two streams are smaller and steeper than those typically preferred by steelhead trout and Chinook salmon. Habitat for westslope cutthroat trout is more abundant in Squaw and Shingle Creeks.

Pools, an important fish habitat feature, are typically created by large woody debris within Squaw and Shingle Creeks and are particularly important for juvenile rearing.

Streambanks are mostly stable and well vegetated. Riparian areas are mostly dominated by western red cedar and grand fir with an understory of moist shrubs, forbs and ferns. Field reviews in 2016 indicate thick vegetative cover along stream banks provided by forbs, shrubs, and trees. The RHCAs are expected to continue to contribute large woody debris and shade to streams as well as act as sediment filters for potential runoff from surrounding hillslopes.

Fish species likely find cold-water refugia in Shingle Creek and Squaw Creek during the warm summer months. Temperatures are not considered limiting to steelhead spawning because they spawn in the spring when temperatures are cold. Temperatures in all streams may exceed ideal rearing and spawning for bull trout during the summer and early fall months.

Overall stream substrates are dominated by larger substrates such as cobbles, gravel and boulders with lesser amounts of gravel. The lack of gravels limit fish distribution and abundance, particularly for steelhead and salmon which require fairly large patches of gravel for spawning. The highest quality and quantity of Chinook salmon and steelhead spawning substrate occurs downstream and outside the project area in the lower reaches of Squaw and Shingle Creek outside of the project area and the Rapid River (not associated with the proposed activities). These stream reaches have lower gradients and larger accumulations of spawning gravel than other tributaries in the project area.

Aquatic Species

Forest service fish sampling records were used to produce fish species distribution mapping along with critical and/or essential fish habitat mapping NOAA Habitat Mapping and USFWS Habitat Mapping used to determine habitat usage and proximity to activities.

Bull trout (Salvelinus confluentus) - Bull trout in the Salmon River basin are contained within the Columbia River ecologically significant unit (ESU), which has been proposed for listing under the ESA. The current distribution of bull trout in the Columbia River basin occupies about 44% of the historic range, with the core remaining distribution in the central Idaho mountains (including Red River; NPNF 1998). Population densities and diversities are much reduced in the Salmon River basin from the historic range.

Bull trout were historically less well-distributed throughout their range than other salmonid species, and although they were found in a variety of habitats, distribution was patchy, and spawning and juvenile rearing appeared to be restricted to the coldest stream reaches. Bull trout are believed to be a glacial relict (McPhail and Lindsey 1986), and their distribution probably contracted and expanded periodically with natural climate change.

Bull trout in the Salmon River basin exhibit two distinct life history forms, resident and fluvial. Resident populations generally spend their entire lives in small headwater streams. Fluvial bull trout rear in tributary streams for several years before migrating to larger river systems. Both forms may coexist in some areas. These divergent life histories are viewed as alternative strategies that contribute to the persistence of populations in variable environments.

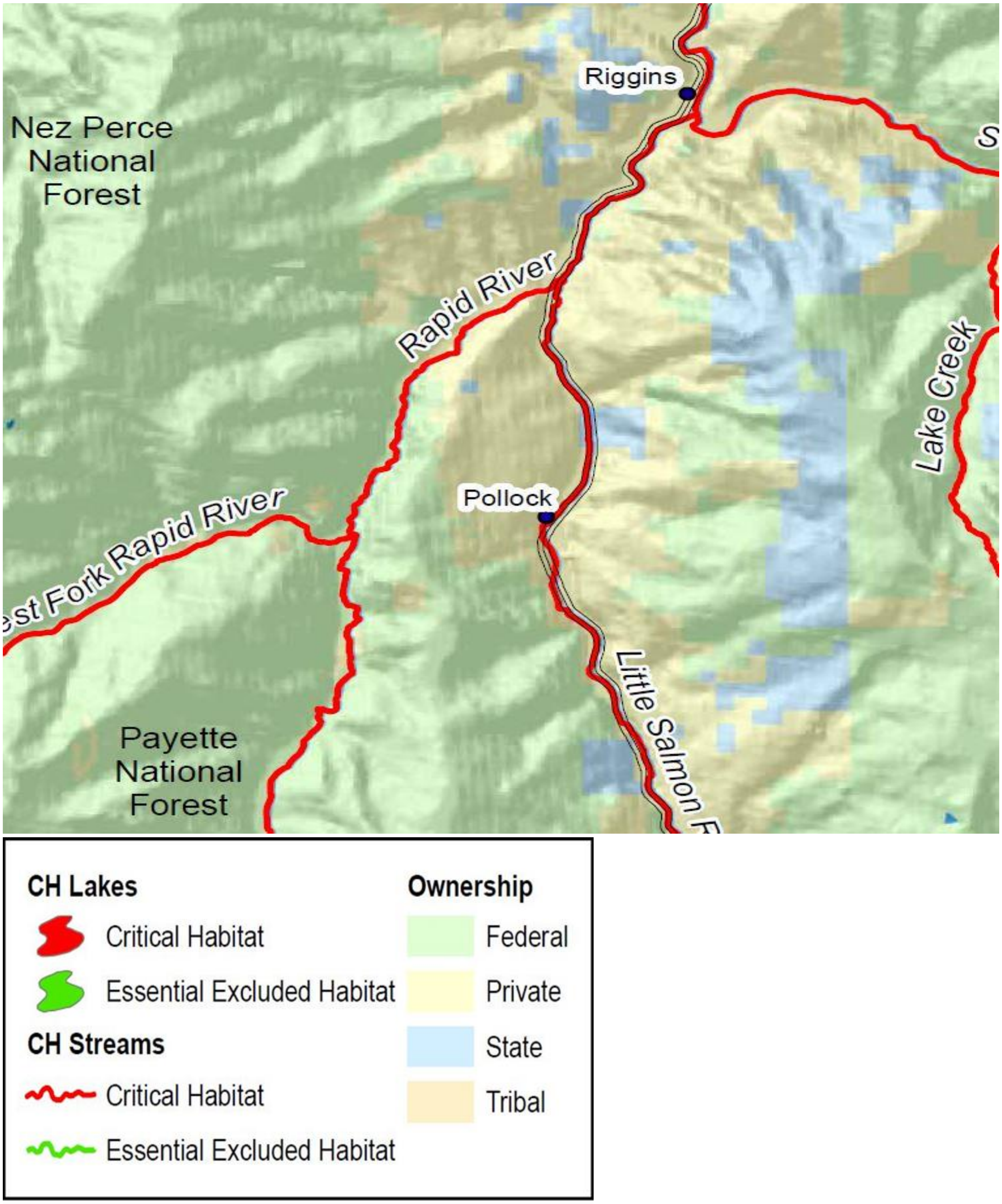
Columbia River bull trout, now listed as threatened species under the Endangered Species Act, are found within the assessment area, and seem limited to the main Salmon River and Rapid River tributary. Bull trout are quite mobile, using certain tributaries for spawning and rearing, and they are generally best described as fluvial fish.

Bull trout spawn from August through November and, although hatching may occur in winter or early spring, alevins may stay in the gravel for extended periods following yolk absorption (McPhail and Murray 1979 cited in Quigley and Arbelbide 1997). Growth, maturation, and longevity vary considerably with environment although first spawning is often noted after age four, and individuals may live more than 10 years (Rieman and McIntyre 1993).

There is no designated critical habitat for or known occupancy of bull trout within the project area streams other than the Rapid River. Designated critical habitat in the main-stem of the Rapid River is approximately 2 miles from any treatment activity and the connected reach is outside of the project area. Designated critical habitat for bull trout also occurs in the Little Salmon River which is outside of the project area but is connected only by intermittent face drainages and perennially flowing Indian Creek. The nearest vegetation treatment activities occur at least one stream mile away from the little Salmon River.

No designated critical habitat or known occupancy of bull trout is located within the project area or in the applicable Forest Plan Prescription watersheds of the Squaw Creek or Shingle Creek drainages. Bull trout require cooler water temperatures than steelhead or salmon resulting in fewer numbers of fish in these streams overall.

Map 1. USFS 2010 Bull Trout Critical Habitat Mapping Showing Distribution Within and Near the Project Area



Steelhead Trout (Oncorhynchus mykiss) - Steelhead are actually rainbow trout that migrate to the ocean and return to fresh water (anadromous fish). Steelhead trout utilize the Salmon River basin for both spawning and rearing purposes, and maintain a naturally reproducing population, but are also influenced by hatchery production. The distribution and abundance have declined from historical levels as a result of passage mortality at dams and other obstructions, habitat degradation, loss of access to historical habitat, over-harvest, and interactions with hatchery-reared and non-native fishes. Steelhead trout in the Salmon River basin are currently listed as a threatened species under the Endangered Species Act.

Idaho hatcheries have influenced the spawning times of their hatchery produced steelhead trout. The hatchery produced steelhead trout returning to the Salmon River basin are primarily in the A-run class. They return from the ocean earlier in the year (usually June through August) and they most often return after spending one year in the ocean. Because they return early in the year and because they usually come back after only one year in the ocean, they weigh 4 to 6 pounds and are generally 23 to 26 inches in length (IDFG. 2006).

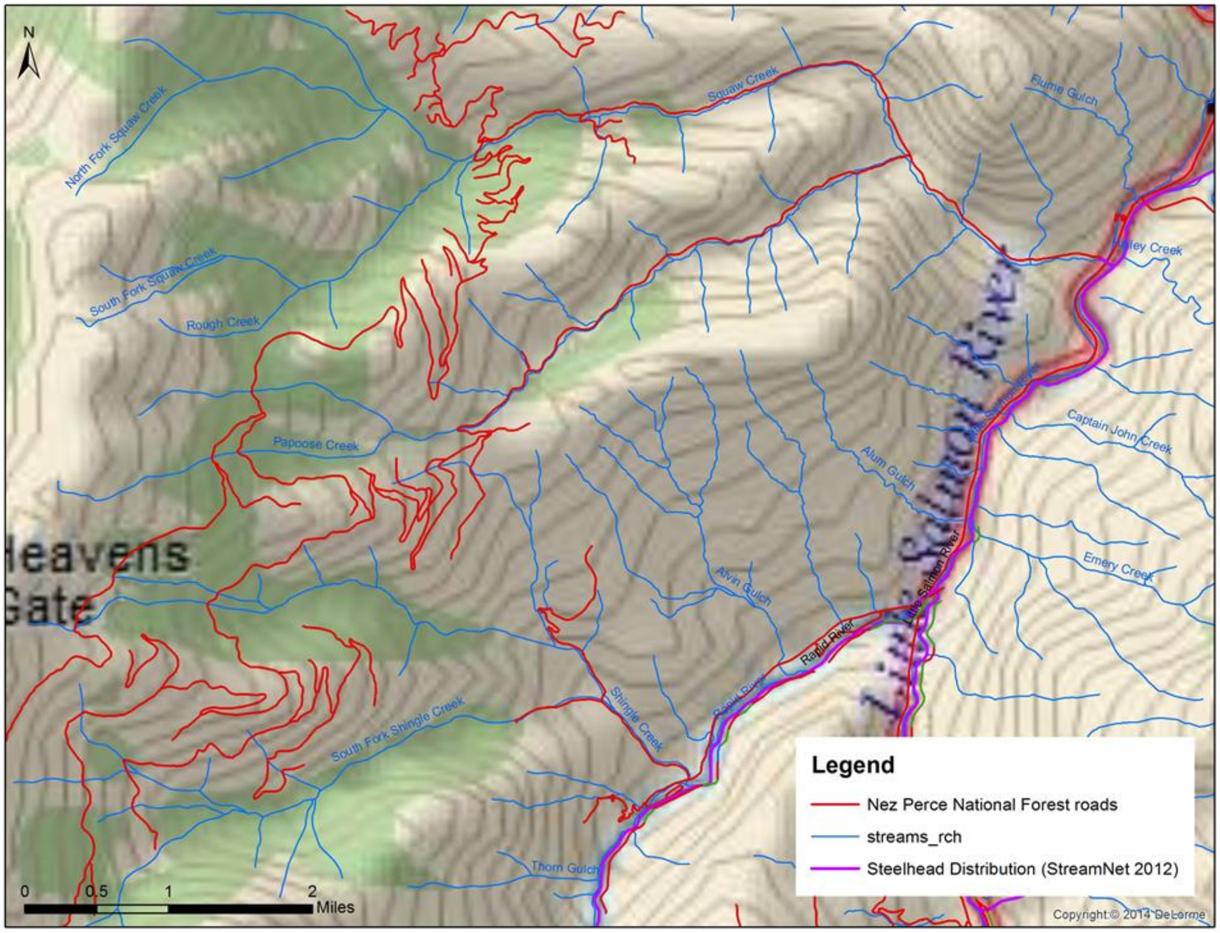
The B-run steelhead most often return to the Clearwater River, but some return to tributaries in the Salmon River. These fish usually spend two years in the ocean, and start their migration to Idaho later in the summer or fall of the year (usually late August or September). Because of the extra year and the extra summer of growing in the ocean, they return as much bigger fish.

Redband trout are the non-anadromous form of this same species and, in the Salmon River basin, have evolved in sympatry with the anadromous population(s). Sympatric redband trout are often termed "residuals", and are morphologically indistinguishable from juvenile steelhead trout. Natural and man-made barriers exist on these channels and populations of Redband trout have been documented above these barriers. In 2005, Redband Trout were removed from the Endangered Species list.

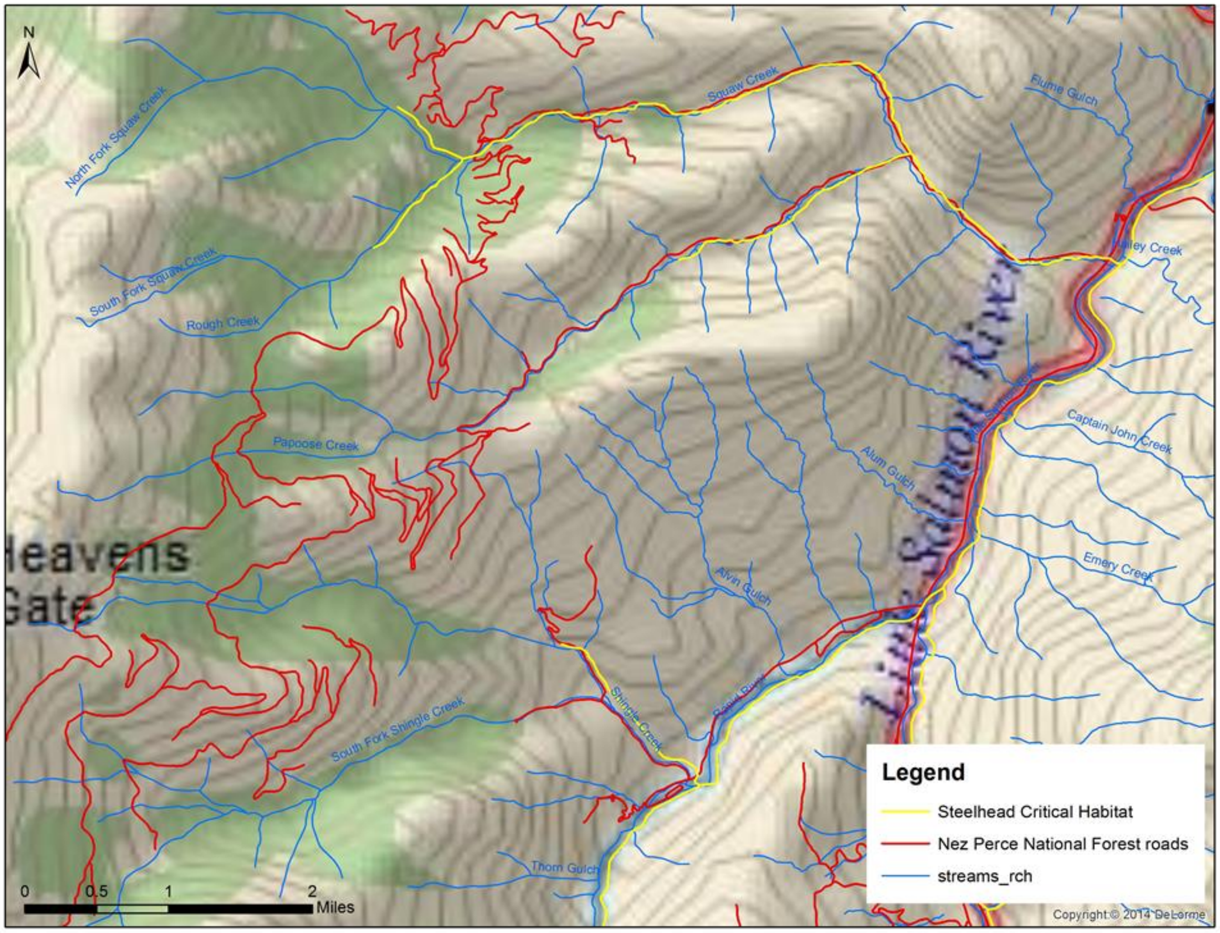
Current distribution of steelhead/redband trout use in the Salmon River basin watershed is thought to be similar to the historic distribution. Spawning and rearing use is known to exist throughout much of the mainstem of Salmon River as well as portions of numerous tributaries. USFS surveys show spawning and rearing of steelhead/redband trout is known to occur in Squaw Creek, Shingle Creek and the Rapid River.

There are about 6.4 miles of designated critical habitat for ESA listed (threatened) steelhead trout in the project area. This includes (~3.4 miles on the Rapid River, and ~3.0 miles in Squaw Creek.) (Map 3). Designated habitat for Steelhead trout exists in Shingle Creek but it is located downstream and outside the project area approximately 1600 feet. Critical habitat in the South Fork of Squaw Creek is located downstream of the activity areas approximately 1500 feet. The lower reach (first 1.85 miles) of Papoose Creek has mapped critical habitat for steelhead, however this reach is outside of the project area and the stream channel is noted as being an intermittent and is non-fish bearing stream according to field surveys. The project area streams containing mapped critical habitat only provide minimal amounts of suitable steelhead habitat due to small stream size, moderate to high stream gradients, and low amounts of suitable spawning habitat.

Map 2. NOAA 2012 Spring/Summer Steelhead Distribution Mapping Showing Distribution Within and Near the Project Area


N
North Fork Squaw Creek
South Fork Squaw Creek
Rough Creek
Squaw Creek
Flume Gulch
Papoose Creek
Heavens
Gate
Alum Gulch
Alvin Gulch
Captain John Creek
Emery Creek
Little Salmon River
Rapid River
Shingle Creek
South Fork Shingle Creek
Thorn Gulch
Legend
Nez Perce National Forest roads
streams_rch
Steelhead Distribution (StreamNet 2012)
0
0.5
1
2
Miles
Copyright:© 2014 DeLorme

Map 3. NOAA 2012 Spring/Summer Steelhead Distribution Mapping Showing Critical Habitat Within and Near the Project Area



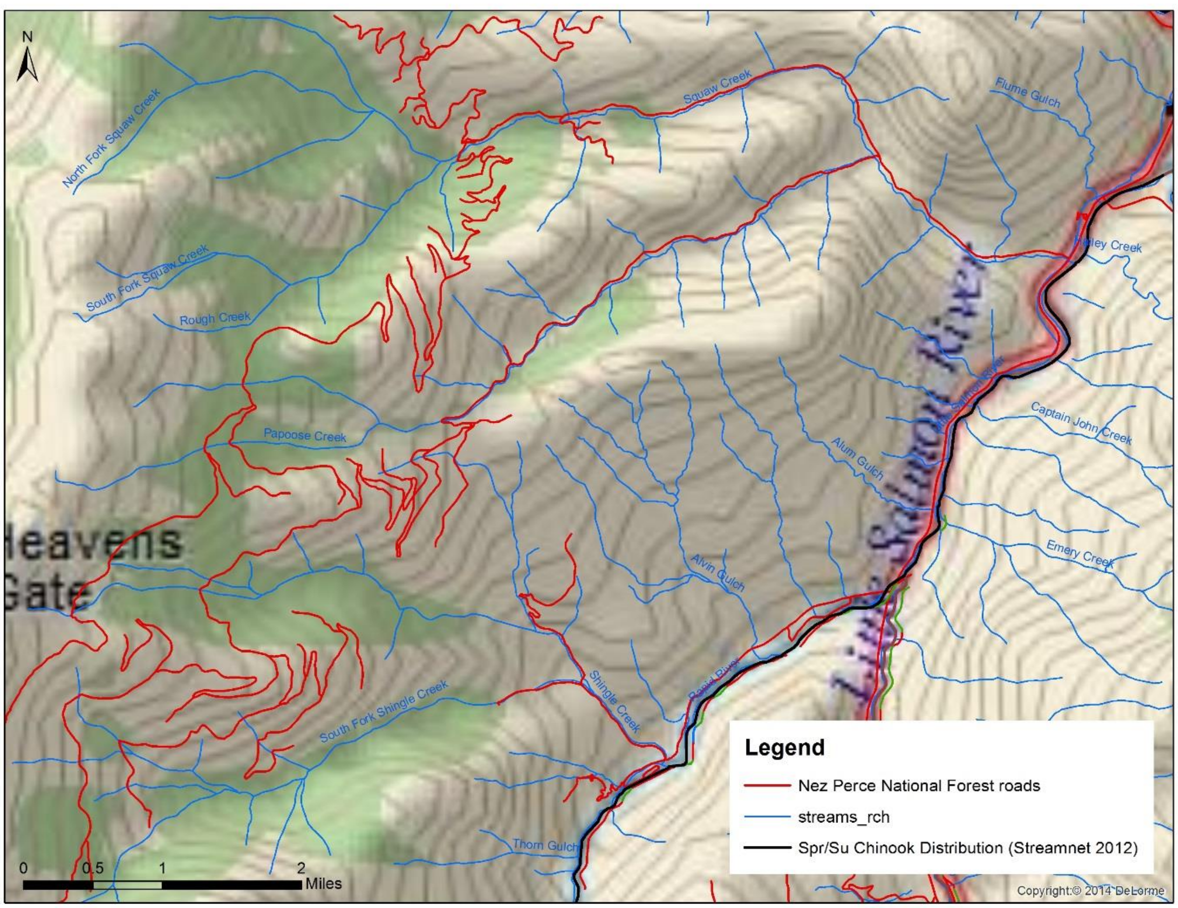
Fall Chinook (Oncorhynchus tschawytscha) and Sockeye Salmon (Oncorhynchus nerka) - There is no designated critical habitat for fall Chinook or Sockeye salmon and no known occupancy of either species within project area tributaries.

Spring Chinook Salmon (Oncorhynchus tschawytscha) – Mainstem Salmon River and its tributaries had a high inherent capability to support spring chinook salmon (USFS 1998). This is based on features such as climate, elevation, relief, and geology. Historic spawning and early rearing habitat in the Salmon River basin most likely included the mainstem of the Salmon River and the lower reaches of some of the larger tributaries, but it is unlikely that it extended into the upper reaches and headwaters of these tributaries. Limiting factors would have included higher gradient, larger substrate, and higher velocities. As with the fall Chinook salmon, spring chinook are also listed as threatened on the Endangered Species Act list.

Habitat requirements of Chinook salmon vary by season and life stage, and the fish occupy a diverse range of habitats (USFS 1998). Distribution and abundance of Chinook salmon may be influenced by cover type and abundance, water temperature, substrate size and quality, channel morphology, and stream size. Cover is essential for adult Chinook salmon prior to spawning, especially for early migrants that remain in tributaries for several months prior to spawning. Key habitat factors for juvenile rearing include streamflow, pool morphology, cover, and water temperature (Steward and 1990). Abundancy of Chinook salmon parr has been found to occur in low gradient, meandering channels. Juveniles also seek areas with cobble or rubble substrate or undercut banks for use as concealment cover (Hillman et al. 1987). Chinook have been located in Squaw Creek, Shingle Creek, and the Rapid River.

NOAA mapping indicates that spring Chinook are not distributed within the project area streams (Map 4). However approximately about 6.4 miles of designated critical habitat for this ESA-listed spring Chinook salmon is mapped in the project area. This includes ~3.4 miles on the Rapid River, and ~3.0 miles in Squaw Creek. Designated habitat for Spring Chinook Salmon exists in Shingle Creek but it is located downstream and outside the project area approximately 1600 feet.) (~3.4 miles on the Rapid River , ~3.0 miles in Squaw Creek and 0 miles in Shingle Creek (critical habitat in Shingle Creek located downstream and outside project area approximately 1600 feet.). Critical habitat in the South Fork of Squaw Creek is located downstream of the activity areas approximately 1500 feet. These streams (other than the Rapid River) only provide minimal amounts of suitable Spring Chinook habitat due to small stream size, moderate to high stream gradients, and low amounts of suitable spawning habitat. Juveniles may use the areas near the mouths of the streams as thermal refugia during the summer months or to escape high spring flows.

Map 4. NOAA 2012 Spring Chinook Distribution Mapping Showing Distribution Within and Near the Project Area



Westslope Cutthroat Trout (Onchorhynchus clarki lewisi) - Westslope cutthroat trout are a Forest Service sensitive species and have been considered for listing under the Endangered Species Act in years past. It is also considered a species of special concern by the State of Idaho.

The subspecies was once abundant throughout much of the north and central portions of the upper Columbia River basin, including the Salmon River and many of its tributaries. Although still widely distributed, remaining populations may be compromised by habitat loss and hybridization with hatchery stocks of rainbow trout and introduced Yellowstone cutthroat trout.

Within the project area westslope cutthroat trout occur in Squaw and Shingle Creeks. Cutthroat can typically occupy smaller streams with lower flows when compared to steelhead and salmon. They require, and can utilize for spawning, pockets of small sized substrates which are common in the middle and upper reaches of streams. Their distribution is the widest among all salmonid species found in the area.

Redband Trout (Oncorhynchus mykiss) - Interior redband trout of the mid and upper Columbia River basin are included as a Forest Service sensitive species in Region 1. *O. mykiss* exhibit both anadromous and resident life history strategies. In Idaho only the anadromous form is listed under the Endangered Species Act although technically the same species as the resident form.

Similar to anadromous steelhead, resident redband trout spawn in the spring, typically at two to three years of age (Benhke, 2002). Because of their much smaller size, spawners are able to use smaller streams and smaller gravels.

Redband rainbow trout are likely found within the project area streams and generally occupy similar habitats as westslope cutthroat trout and thus may be distributed as such.

Pearlshell Mussels - Western pearlshell mussels are not listed under the Endangered Species Act but were added as a sensitive species in Region 1 of the U.S. Forest Service in 2010. The species appears to be declining across its range, including areas in the mainstem Snake and Columbia Rivers (Nedeau et al. 2009).

Mussels are not likely present and none were observed during field surveys 2016. They prefer low gradient stream channels and stable habitats near banks with coarse sand, and cobble or boulder substrates. There is very limited habitat for pearlshell mussels in the project area streams, generally due to higher mostly as a result of high stream gradients streams.

Pacific lamprey – Pacific lampreys are not currently listed under the Endangered Species Act but are designated by the Idaho Department of Fish and Game as a state endangered species. They are included as a sensitive species by Region 1 of the U.S. Forest Service.

No lamprey are known to occur within the project area. Both spawning and rearing habitat is limited by stream gradients and substrates. Lamprey habitat is similar to that preferred by pearlshell mussels. The Nez Perce Tribe is actively restoring Pacific lamprey populations to the basin. The mainstem of little Salmon River (outside the project area) provide migration, rearing and spawning habitat for the lamprey.

Direct/Indirect/Cumulative Effects of the Proposed Actions to ESA-Listed Species and Designated Critical Habitat

Table 4: Summary of Trends Regarding Principal Watershed Factors and Indicators (Proposed Action)

Principal Aquatics Factors	Principal Indicators	Trend
Potential Sediment Production and/or Reduction from Vegetation Treatments, Road management, log haul, watershed improvements	Change in the Magnitude of Sediment Yields.	Trend long-term in sedimentation would likely have a slight reduction given the road decommissioning and road improvements with some short term risk of sedimentation at road crossings. BMPs and Design elements would minimize the amount and risk. Closest DCH to harvest activity areas is approximately .5 miles away. Fish habitat objectives would be met in applicable prescription watersheds and there would no substantial change in fish habitat.
Stream Channel Stability and Effects From Changes in Stream Flows and/or Sedimentation	Predicted Channel Responses or Changes That May Result From Natural Events and/or Human Disturbance.	Stream channel stability which can affect fish habitat objectives would generally be maintained in an upward trend condition given the existing conditions, maintenance of RMOs and continued LWD inputs from PACFISH buffers and riparian zones. Riparian roads densities are all in “good” condition and don’t indicate that RHCA are a problem but would continue to trend toward improvement. The existence of some riparian roads would be still remain a source of riparian sedimentation cumulatively. Potential for Large-scale canopy opening events (stand replacing type) such as wildfire, which could subsequent reduce cover could increase the potential for erosion due to peak flow fluctuations and sedimentation, would be generally reduced. Harvest created canopy opening may increase waters yield however would likely not impact water quality to stream channels.
RHCA road densities and Road/Stream Crossings	Change in RHCA road densities and Road/Stream Crossings	Slight reduction in RHCA road densities and stream crossings which may reduce sedimentation from roads long term over the existing condition.

The following table discloses the proposed activities that may have a positive of negative effect on aquatic habitats and species.

Table 5. Proposed Action Alternative- Activities Associated with Roads

Activity	Quantity	Description
Road Decommissioning	5.6 miles	Roads proposed for decommissioning would be recontoured or naturally stabilized and would no longer be used for transportation. A total of 0.5 of these miles occur within PACFISH RHCAs. A minimum of 15 culverts would be removed.
Road Improvement	20.6 miles	Portions of the total length would be treated as needed with the proposed action. Consists of spot treatments, such as road blading, brushing, cleaning of culverts, removal of small cutslope failures, application of rock in wet spots and removal of obstructions such as trees, rocks, etc. Aggregate (gravel) placement would occur along the entire length.

Culverts Replaced	~4	Would improve slope stability and hydrologic function and would improve drainage and would reduce the potential risk of mass erosion from culvert or fill failures.
Road Maintenance Treatments	41 miles	Surface reshaping, installation of drainage dips and functioning ditches and repairing small slides and slumps and culvert maintenance can greatly reduce potential for sedimentation and/or erosion and rutting from roads and would likely improve existing watershed conditions and water quality to project area streams.

Effectiveness of Design elements and BMPs

PACFISH RHCAs: No harvest has occurred in the project area in over 20 years (1996) with most occurring 30-40 years ago. All management activities since 1995 have implemented PACFISH buffers in order to eliminate or reduce impacts to riparian areas and streams. With no new large disturbance in RHCAs, there should be no long term negative changes to the measured habitat parameters as a result of post-1995 timber harvest activities. Various field reviews and monitoring activities support the conclusion that the habitat conditions have likely improved since the mid-eighties. Much of the recovery is likely a result of less land disturbing activities, better application of BMPs, RHCA retention, and better road design (CNF, 2008; pg. 91).

Monitoring results from the PACFISH/INFISH Biological Opinion (PIBO monitoring across the Upper Columbia River Basin) indicate improving trends in pool depth, bank stability, large wood frequency and volume in both reference and managed sites (USDA Forest Service 2012 and 2016). There were no significant trends for percent fines, and negative trends in the percent of pools were observed in both reference and managed sites. Because the trends were similar at both reference and managed sites, they surmised that the lack of or negative trends in percent fines and pools may not be management related. A summary of PIBO data collected between 2001 and 2013 just within Region 1 of the Forest Service showed desired trends in all parameters except for percent pools (USDA, 2016, unpublished report). Percent pools had an overall 2% decrease where increases would have been expected. The overall percent pool tail fines (a measure of fine sediment) decreased by 14% within the region which is the desired trend for sediment. The 2016 PIBO summary for the Lower Salmon River indicates positive trends in macroinvertebrate and bank stability. There were no significant trends, either positive or negative, detected for percent undercut banks, large woody debris, percent pool tail fines, percent pools, pool depth or median substrate size. The data suggests that PACFISH RHCAs are effective at reducing impacts to riparian areas and streams from management activities.

Local monitoring of 23 miles of RHCAs and 5.5 miles of temporary road after timber harvest and burning of the units was completed on the Lochsa District in 2014 (Smith, K. 2016, unpublished report. There was no evidence of sediment moving from harvest units into RHCAs or sediment moving from temporary roads into harvest units or RHCAs. The thick vegetation that makes up RHCAs acts as an excellent, virtually impenetrable, filtering source for overland sediment flow. Retaining downed woody debris within the harvest units also provides structures that capture sediment and slow or stop its movement down the slope.

No-harvest buffers of 100- 150 feet adjacent to streams within timber sales have been shown to be adequate in protecting the riparian vegetation necessary to maintain natural stream temperature levels (Anderson and Poage 2014; Ott et al 2005; Lee et al 2004; Sridhar 2004; FEMAT 1993). PACFISH buffers greatly exceed these guides on fish bearing streams and meet the guides on non-fish bearing and intermittent streams.

Best Management Practices (BMPs): BMPs would be followed for all action alternatives as stipulated by the Idaho Forest Practices Act. Idaho water quality standards regulate non-point source pollution from timber management and road reconstruction activities through the application of BMPs. The adjacent Clearwater National Forest has an excellent record of successful implementation of BMPs. Between 1990 and 2002, the Forest had a BMP implementation rate of 98% and a 97.8% rate of effectiveness (USDA Forest Service, 2003). Survey results from 2004 through 2008 indicate implementation and effectiveness rates of 98% or greater (these reports can be found at: http://www.fs.usda.gov/detail/nezperceclearwater/landmanagement/planning/?cid=stelprdb5408439. Additionally, third party water quality audits by the Idaho Department of Lands have shown a high implementation compliance rate (~99%) for timber sale projects on National Forest System Lands in Idaho, including the Nez Perce Clearwater National Forest. Best management practices and post-harvest monitoring has been conducted by forest staff to validate the implementation and effectiveness of BMPs and design criteria associated with land management activities and most recently in the Idaho 2016 Interagency Forest Practices Water Quality Audit completed by the Idaho Department of Environmental Quality (December 2016). Monitoring results are used to adapt future management actions, where improvements in meeting objectives are indicated, and show that acceptable productivity potential is maintained. The same BMPs are applied to Windy Shingle Project and are expected to have similar results.

Road Work BMPs and Design Element Effectiveness: Road improvement/maintenance includes brushing, blading, and spot surfacing roads with gravel where needed. Blading and rocking is done to provide an even and reinforced running surface that can withstand truck traffic. Cleaning ditches and adding cross drains can also occur to maintain or improve drainage. Cleaning ditches can increase sediment f not done appropriately (Luce and Black 2001). Cleaning of ditches will only be done where it will reduce potential for erosion and damage to road beds. Overall these activities are considered beneficial to water quality (Burroughs 1990; Grace and Clinton 2006; Switalski et al. 2004; Swift and Burns 1999). Foltz (2008) showed that the use of high quality aggregate (gravel) produced 3 to 17 times less sediment than marginal quality aggregate. A study by Swift (1984) showed that placement of a 6-inch lift of 1.5-inch minus crushed rock reduced sediment production by 70 percent from the unsurfaced condition over a 5-month period. The gravel achieved this amount of protection even though this period included 6.46 inches of rainfall in 5 days. In 13.3 months, the gravel with established grass at the margins of the traveled way reduced sediment production by over 84 percent compared to 9.5 months when the road was unsurfaced; [cited in Burroughs and King, 1989]. The Upper Squaw Creek (Road 487), Lower Squaw and Papoose Creek (Road. 517), Upper Watershed Road (Road. 2109) and The Indian Creek (Road 624) roads are regularly graveled to maintain them in optimum conditions for travel and may receive spot treatments of gravel where it will reduce potential for erosion and damage to road beds.

Burroughs and King (1985) also conducted a study on the Nez Perce Forest using simulated rainfall to generate runoff and sediment yield from forest roads, ditchlines, and fill slopes. The reduction in sediment production by graveling the road was 79% and remained effective for several years. They also found that where dense grass cover was present on the fill slopes of the road, sediment yield was reduced by 99%. The cut and fill slopes and ditchlines of roads within the within the Windy Shingle project area are densely vegetated with grasses and shrubs. These conditions, along with the perpendicular stream/road crossings minimize the risk of roads contributing large amounts of sediment to streams.

The treatments also include adding cross drain culverts near flowing streams in order to divert ditch water and its associated sediment onto the forest floor instead of into the stream. Damian (2003) found that installation of cross drains at optimum sites reduced sediment delivery by 76%. The most important location for a cross drain was within 100-200 feet from a stream crossing. A number of studies have also shown that roads can affect the volume and distribution of overland flow and alter channel network extent, pattern, and processes (Harr et al., 1975; King and Tennyson, 1984; Montgomery, 1994; Jones and Grant, 1996; Wemple et al., 1996, 2001); [cited in Croke, et al., 2005]. Water control structures, such as ditches with relief culverts, broad based dips, water bars, and turnouts, are used to drain insloped road surfaces and minimize the travel length of overland flow (Keller and Sherar, 2003); such that, increasing number of cross-drains reduces drainage area that collect water, reduces erosion, and hydrologic connectivity of road segments to streams [cited in Brown, et al., 2013]. Field observations noted much of the road network is outsloped away from ditchlines particularly on curves in the road prism. The proposed action also includes the replacement of existing culverts at live stream crossings that are sized for a 100-year flow event. Culverts sized to handle these events are less likely to plug with debris and fail when compared to smaller pipes.

Dust abatement on log haul roads is designed to minimize the amount of road related sediment (via fugitive dust and road surface erosion) added to streams. A 1993 study by Sanders and Addo showed that dust abatement produced half the amount or less of dust as untreated graveled roads. They also showed that traffic speeds affect the amount of dust produced. Slower traffic speeds (20 -30 mph) produce half as much dust as higher speeds (40+ mph). Log haul traffic speed is not expected to exceed 25 mph and would be closer to 15 mph due to the narrow, twisty road network in the project area. Monlux (2007) found a 90% reduction in observed dust. He also found that the dust abated roads required less surface blading than untreated roads. Blading on untreated roads was required after 3,200 vehicles while blading on treated sections was needed after 25,500 vehicles. All haul roads would receive dust abatement treatments prior to log haul and would have operational limitations, such as no travel during wet periods that could cause erosion or rutting.

Design elements would be used to minimize direct input of sediment to streams from management activities and are summarized here: PACFISH RHCAs would be retained on perennial and intermittent streams adjacent to timber harvest units. Temporary roads would be built along or near ridgetops with no stream crossings and no hydrologic connectivity to streams. They would be obliterated within 3 years of the end of the project. Road improvement and maintenance treatments would install cross-drain culverts and dips at specified key locations to divert roadside ditch flow onto the forest floor instead of into streams. Road surfacing with gravel on improvement roads would also occur where needed to minimize sediment production and delivery to streams. Road to be decommissioned would have all perennial and intermittent stream channel crossings structures removed along the road prism and would recontour roads within RHCAs.

Standard and site-specific BMPs to protect soil and water, and practices as described in the SWCP Handbook (FSH 2509.22 USDA 1988), are included as design elements and would be applied during timber harvest, prescribed burning, temporary road construction and road decommissioning, closure and maintenance, to minimize soil erosion. The BMP techniques and their effectiveness are documented in several publications (Seyedbagheri 1996; Idaho DEQ 2001). They have been shown to maintain acceptable soil productivity (Seyedbagheri 1996) and minimize sedimentation. The SWCP Handbook outlines BMPs which meet or exceed Idaho Forest Practices, Rules, and Regulations that protect soil and water.

Best management practices and post-harvest monitoring has been conducted by forest staff to validate the implementation and effectiveness of BMPs and design criteria associated with land management activities and most recently in the Idaho 2016 Interagency Forest Practices Water Quality Audit completed by the Idaho Department of Environmental Quality (December 2016). Monitoring results are used to adapt future management actions, where improvements in meeting objectives are indicated, and show that acceptable productivity potential is maintained.

The BMPs would have a high effectiveness in minimizing soil compaction and displacement (i.e., erosion), address seeding of disturbed areas, limiting operations when soil moistures are high (on roads as well), and addressing conduct of logging. Design elements also require timber and slash piling machinery to use existing trails and to stay on slopes less than 35% to prevent soil disturbance in excess of guidelines. Design elements for grapple piling include operation preferentially reusing existing skid trails if present. Forest plan monitoring and research (Eliasson and Wästerlund 2007) indicates a reduction of soil disturbance if equipment is operated on a slash mat. As previously discussed BMP monitoring of past buffers on units has shown that PACFISH RHCAs protect instream conditions from timber harvest effects in terms of sedimentation.

Large woody debris is essential for maintenance of sufficient microorganism populations and long-term ecosystem function, as well as preventing and/or minimizing erosion (i.e., sedimentation). Design elements (table 3 and page 8) are incorporated into the activities to manage large woody debris and organic matter within harvest units as described by the "Coarse Woody Debris, Snag and Green Tree Retention Guidelines" (USDA 2008).

Direct and Indirect Effects from Timber Harvest, Prescribed Burning and Temporary Roads: No direct or indirect discernible effects to aquatic habitats or fish species are expected from timber harvest, prescribed burning or temporary road construction. As discussed above, RHCA buffers, BMPs and design elements are effective at preventing sediment delivery to streams from these activities based on local and regional monitoring and other documentation. Riparian buffers provide all the components (e.g. instream LWD and future recruited LWD) necessary to build aquatic habitats and are also effective at maintaining stream channels and temperatures. Study results show that wood exerts a primary control on channel morphodynamics in intermediate sized streams. The morphologic and hydraulic changes induced by the addition of large woody debris were shown to increase pool frequency and depth variability, enhance floodplain connectivity, and retain substrates optimal for spawning while reducing stream velocity and limiting downstream movements of sediments though storage (Davidson and Eaton 2013). Instream wood decreases potential for sediment transport and in-filling of scour pools (Davidson and Eaton 2013). Furthermore, wood within valleys and stream channels drives physical complexity of the river network, leading to temporal and spatial changes of channel-floodplain connectivity, stream morphology, sediment storage and flow (Piégay and Gurnell, 1997; McHenry et al., 1998; Mutz et al., 2000; Sear et al., 2000; Jeffries et al., 2003; Phillips, 2012; Davidson and Eaton, 2013).

BMP monitoring of past buffers on units has shown that PACFISH buffers protect instream conditions from prescribed burning effects in terms of sedimentation.. Fire can back down into the RHCAs but local monitoring indicates it doesn't travel far and rarely reaches water due to high relative humidity. Although potential for some sedimentation was modeled for harvest activities (see watershed report) it is unlikely that any discernible sedimentation would reach stream channels based on local monitoring.

No effects to water quality or fish habitat within the project area are expected from Timber Harvest, Prescribed Burning and Temporary Roads given the activity locations outside of RHCA and the use of sediment minimizing BMPs such as operating during dry periods or when ground is snow covered and retention of coarse woody debris with in the units.

No discernable effects from temporary road construction are expected as no roads would cross live streams or be hydrologically connected to streams. There would be no delivery mechanism for sediment to reach streams from these roads.

Direct and Indirect Effects of Road Improvement, Road Maintenance Treatments and Log Haul: Approximately 58 miles of road maintenance treatments or road improvements would occur before log haul begins. Minimal downstream effects are expected when the new upsized culverts are re-watered. The fish bearing crossing, the streams associated with culvert upsizing are in general small streams that are likely nearly dry when culverts would be replaced. The negligible amount of sediment added (about 4 pounds per site based on Foltz et al, 2008) would not affect fish or their habitat as the crossings are at least a mile away from fish bearing portions of project area streams. In general the replacement of culverts would likely improve water quality by reducing sedimentation and risk of culvert failure over there long term.

The road work would replace or add several cross drain structures which may include culverts, rolling dips or water bars to reduce sedimentation potential over the existing conditions (therefore improving the existing condition as it relates to water quality). There would be no negative direct or indirect affects to streams since no live water is involved in the cross drain work. Positive effects from the addition of cross drains are expected as they would route potential ditchline sediment away from streams. Ditchline cleaning would only remove material where ditches are plugged or not functioning. Long lengths of ditch would not be bladed retaining the thick grass that is currently present and acting as a sediment filter.

There are 5 main haul routes each with sections adjacent (approximately 50 to 300 feet) to either perennial or intermittent streams. Main the main haul routes include sections of Roads 487, 2109, 517, 624 and 2056. The table below displays the approximated percent of haul that would occur on each of these road segments as well as approximated distances of haul adjacency to streams and corresponding average stream buffer widths.

Table 6.

Watershed	Road #	Adjacent Creek	Miles of haul adjacent to stream	Average buffer width (road to stream)	Buffer type/condition	Perennial crossings	Intermittent crossings	% of haul
Squaw Creek	487 & 517	Squaw Creek	~5.0	~150ft	Mostly forested/closed canopy	2	1	~10 %
Papoose Creek	517	Papoose Creek	~5.5	~100ft	Mostly forested conifer and/or shrubs	2	1	~20%
Shingle Creek	2109	Shingle Creek	~.15	~150ft	Mostly forested conifer	1	3	~10%
Shingle Creek	517	Shingle Creek Headwaters	~.15	~150ft		0	3	~10%
Face Drainages near Indian Creek	624 & 2056	Un-named	~.25	~150Ft	Mostly forested conifer and/or shrubs	0	4	~50 %

Log haul within the project area would not cause water quality to be appreciably reduced given the limited amount of live stream crossings and to streams use of BMP such as road maintenance and operational limitations such as road closures and haul suspension during wet periods and/or storm events which would reduce potential for sedimentation caused by log haul.

Currently, the road segments as discussed in table 6, pose minimal risk of sedimentation and erosion from motorized travel because they are; only minimally hydrologically connected to streams by ditches (the majority of crossings are ditch relief), outsloped, relatively flat road grades, mostly well graveled, and well vegetated (conifers and or shrubs) riparian buffers. When combined with the proposed pre-haul road maintenance and/or improvements to further make the roads pristine and/or increase safety and hydrologic function, along with dust abatement activities and other protective operational restrictions, undiscernible amounts of sediment to creeks from log haul is expected. Dust abatement will be required as a BMP and log haul would occur during dry or frozen conditions with most occurring between the months of June and September greatly minimizing potential for erosion and sedimentation.

Road Decommissioning and Storage: Roads not needed for future management are being decommissioned. Approximately 5.4 miles of road would be decommissioned. Table 7 summarizes the stream crossings to be removed, and road miles to be decommissioned within the project area and within the prescription watersheds.

RHCA road densities would be reduced slightly from the existing condition over the entire project area and within each of the prescription watersheds. Final RHCA road densities for the project area and the prescription watersheds would remain within the NOAA "good condition" category.

Approximately 15 culverts would be removed which would reduce the risk of potential future crossing failures (Foltz et al, 2008; McCaffrey et al, 2007; Switalski et al, 2004; Beschta, 1995). The reduction of risk is expected to have long term benefits to project area watersheds (McCaffrey et al, 2007; Switalski et al, 2004). Assuming there are 100 cubic yards of fill material over each crossing, a total of 1500 cubic yards (50 dump truck loads) of material would be removed and would no longer be at risk for future failure into streams. In addition, decommissioning would remove the road prism placing the areas in a permanent hydrologically stable condition.

Table 7. Road decommissioning RHCA miles treated and crossings removed by prescription watershed.

Prescription Watershed	Total Stream Crossings Removed	RHCA Decommissioned Roads
		System (miles)
Squaw Creek	5	.34
Papoose Creek	2	.14
Shingle Creek	1	.1
Indian Creek	3	.2
Face Drainages	4	.27
Totals	**15**	**1.05**

Culvert removal would have the greatest long term positive effect to streams from proposed activities. They would contribute small amounts of sediment in the short term although BMPs should nearly eliminate any potential for sedimentation.

The estimated amount of sediment potentially added to a stream from culvert removals when BMPs are applied averages 0.002 tons (4 pounds) per site (Foltz et al. 2008). Therefore the removal of all 15 crossings and the fill material associated with them could add 60 pounds of sediment to project area streams. The majority of turbidity associated with culvert removals is associated with the disturbance of existing instream sediment. Very limited amounts of new sediment are added to the stream due to design elements and BMP implementation. This amount of sediment would be likely be so little as to be unmeasurable in fish bearing streams within prescription watersheds. No direct effects to ESA-listed fish species or their habitats would occur, as none are known to reside within a minimum of approximately 2,000 feet of any of the removal sites. Culvert removals would provide indirect benefits to the aquatic system by eliminating the risk of future crossing failures which could produce an extensively larger amount of sedimentation.

Westslope cutthroat trout could be indirectly affected during the removal of one intermittent stream crossing on Road 60010 which is upslope about 800 feet from Squaw Creek. The stream would be dry during culvert removal activities; however, sediment may be delivered to Squaw Creek during spring runoff within the first year after decommissioning. The placement of woody material and other vegetation on the surface of the recontoured road is expected to minimize the amount of erosion that occurs. The road expected to be vegetated and stable within two years based on local monitoring of similar projects.

Undersized Culvert Removal: Minimal short-term sedimentation may occur during one wet season following culvert removal. BMPs, which include erosion control techniques such as seeding and mulching and use of silt fences would likely eliminate potential for discernable water quality effects.

Project timing (low flow), along with the use of sediment reducing BMP's would be implement and would likely render any sedimentation effects undiscernible.

NEZSED Results:

Table 8. Sediment yield predictions

Prescription Watershed	Percent Over Base				
	Existing	WS Year 1	WS Year 6	WS Year 10	Sediment Yield Guideline *
S. Creek	1.0	4.87	2.61	2.58	45
Shingle Creek	0.2	17.0	1.14	0.74	50
*Forest Plan Appendix A allowable percent sediment yield over base to meet fish habitat/water quality objective					

Timber harvest and temporary road construction in the relevant prescription watersheds are not likely to contribute to negative cumulative sediment effects due to streamside buffer retention and road location. Although NEZSED model results showed increases in sediment yield, most are associated with roads. The Hydrologist modeled sediment yield in NEZSED and WEPP. NEZSED estimates that approximately 100% of the project area erosion over baseline levels originates from the existing road system.

Actual sediment delivery to streams from harvest units and temporary roads is not expected to be measurable based on monitoring and field reviews, and PACFISH buffer retention (Smith, K. 2016). Predicted short term (modeled for year 1) changes in cobble embeddedness did not increase above 3% in Squaw Creek or 10% in Shingle. Over ten years this small change in embeddedness would decrease but still would be overall negligible. Therefore no substantial changes in cobble embeddedness are expected or changes that would discernably reduce fish habitat. Sediment increases in project area streams are expected to be so low as to be unmeasurable as a result of vegetation treatment activities, with the design elements and effectively implemented BMPs. Retention of buffers, live and dead trees, downed woody debris, and ground based vegetation throughout the units provides structures that would capture sediment and minimize it from moving down the slope. (Personal observations made by Karen Smith) of completed regeneration harvests containing PACFISH buffers on the Clearwater National Forest between 2000 and 2013 show that buffers prevent sediment from reaching streams. Local monitoring of 23 miles of buffers and 5.5 miles of temporary road after timber harvest and burning of the units was also completed on the Lochsa District of the Forest in 2014 (Smith, K. 2016). There was no evidence of sediment moving from harvest units into buffers or sediment moving from temporary roads into harvest units or buffers. Retaining downed woody debris within the harvest units provides structures that capture sediment and slow or stop its movement down the slope. The monitoring included harvest units with hillslope gradients ranging from 10 to 60% with an average of 35%.

The use of roads for log hauling is not expected to generate measurable amounts of sediment in streams as dust abatement during log haul, proposed improvement/maintenance treatments and operational limitations which reduces the risk and amount of erosion (rutting) and sediment delivered to streams. A 1993 study by Sanders and Addo showed that dust abatement produced half the amount or less of dust as untreated graveled roads. They also showed that traffic speeds affect the amount of dust produced. Slower traffic speeds (20–30 mph) produce half as much dust as higher speeds (40+ mph). Log haul traffic speed is not expected to exceed 30 mph and would be closer to 20 mph due to this narrow section of road.

FISHSED Results

Existing cobble embeddedness data was combined with NEZSED outputs for peak sediment yield in the FISHSED model. The model is used to predict changes in cobble embeddedness, and summer and winter rearing carrying capacities for steelhead trout and salmon. The model documentation (Stowell et al, 1983) states model outputs are not absolute numbers of high statistical precision and results obtained are to be used in combination with sound biological judgment. The limitations and assumptions about the model can be found in and (Stowell et al, 1983).

Utilizing the NEZSED-derived percent over base sediment yield values, FISHSED modeling was employed to predict cobble embeddedness for each prescription watershed with confirmed fish presence in the first year following the proposed activities. Based on NEZSED results found in the watershed report for the project for prescription watersheds, with relevant forest plan fishery objectives, it was determined that the proposed project would cause slight increases (5% for Squaw Creek and 17% for Shingle Creek) in short-term (Year 1) sediment yield, while the sediment yield in the long-term (at Year 10) for prescription watersheds related to relevant forest plan fishery objectives, would be also slight and essentially unmeasurable (1-3%).

Cobble embeddedness in Squaw Creek is expected to increase by 3% in any year given the proposed action, while the Shingle Creek prescription watershed would not increase by more than 10% in any year and therefore are not considered to be substantial enough to signify increases in cobble embeddedness (Stowell et al. 1983). Furthermore no substantial changes in cobble embeddedness and summer/winter habitat rearing capacity are expected based on PACFISH and local effectiveness monitoring (USDA Forest Service 2009a; Smith, K. 2016). Having no appreciable effects to cobble embeddedness would allow for the continued upward trend for fish habitat carrying capacity in the relevant prescription watersheds.

FISHSED modeling of proposed activities effects to fish habitat over the 10 year period following implementation indicate an improvement in cobble embeddedness conditions compared to the first year following implementation and not measurably different than the existing condition. Long term FISHSED results of the proposed action show all measures of fish habitat carrying capacity (i.e. cobble embeddedness, summer rearing, and winter carrying capacity for juvenile steelhead trout) returning to levels close to the existing condition and under the 10% change threshold. Changes in Cobble Embeddedness greater than 10% are considered to be showing measurable change according to forest's own interpretation of FISHSED modeling results (Stowell et al. 1983). FISHSED modeling indicates no measurable change from baseline conditions in summer rearing or winter carrying capacity.

Table 9. Changes from Baseline in Cobble Embeddedness, Winter Carrying Capacity and Summer Rearing Potential by Relevant NPFP Prescription Watersheds in year 1 Given the Proposed Action.

	Existing (2016) (Baseline) % Cobble Embeddedness	Existing (Baseline) % Summer Rearing	Existing (Baseline) % Winter Carrying	Proposed Action % Change Cobble Embeddedness (year 1)	Proposed Action % Change Summer Rearing (year 1)	Proposed Action % Change Winter Carrying (year 1)	Greater than 10% change?
Squaw Creek	17	98	56	3	- <1	-1.5	N
Shingle Creek	15	99	60	10	- <1	-5	N

Table 10. Changes from Baseline in Cobble Embeddedness, Winter Carrying Capacity and Summer Rearing Potential by Relevant NPFP Prescription Watersheds in year 10 Given the Proposed Action.

	Existing (2016) (Baseline) % Cobble Embeddedness	Existing (Baseline) % Summer Rearing	Existing (Baseline) % Winter Carrying	Proposed Action % Change Cobble Embeddedness (year 10)	Proposed Action % Change Summer Rearing (year 10)	Proposed Action % Change Winter Carrying (year 10)	Greater than 10% change?
Squaw Creek	17	98	56	1	- <1	- <1	N
Shingle Creek	15	99	60	0	0	- <1	N

All current (2016 data) and predicted (proposed action, year 1and all other years) fish habitat potential values meet or exceed Forest Plan Appendix A Fish/Water Quality objectives for the relevant prescription watersheds. However, habitat carrying capacity for prescription watersheds returns to (or slightly below) existing condition 10 years following the all of proposed action implementation.

In summary, there would be long-term positive indirect effects to listed and sensitive fish species as a result of the road-related sediment reduction activities previously discussed. These are expected to last at least 15 years but could have benefits up 50 years or longer (50 years is the average life span of a culvert). No long term indirect effects from timber harvest, temporary roads, or log haul are expected due to the implementation of design elements and BMPs. Cobble embeddedness is not expected to measurably increase from management related activities and riparian areas would continue to function naturally from a lack of activities within them. The action alternatives would allow for the continued upward trends in habitat capability in project area prescription watersheds.

Stream Channel Stability

Large storm events tend to saturate catchments to a point where the degree of forest cover becomes insignificant. Increased stream flow as a result of cover reduction is more likely from events with frequent return periods, as shown by Grant et al. (2008). Protective riparian and stream bank vegetation commonly protects channels from small to moderate floods. Forests can mitigate small and local floods, but do not appear to influence either extreme floods or those at the large catchment scale. Where riparian vegetation is well established and floodplains are intact, the risk of channel degradation from increased management-induced streamflow is quite low.

2016 Stream surveys on the project area and prescription watershed streams were assessed using Rosgen channel typing and Pfankuch Stream Channel Stability surveys and described in the Methods Section and the Existing Conditions section to the describe the hydrology, soils, and vegetation of riparian areas in the project area and to rate the health/stability or state of physical processes of riparian areas. Several factors can limit channel functionality/stability, which include a lack of large woody debris, inadequate riparian vegetation (i.e., structure and composition), and excessive bank erosion and channel aggradation.

In forested ecosystems woody debris plays a particularly important role in smaller 1st and 2nd order streams (which are the majority of the stream in the project area), since it slows stream flows, dissipates energy, stores organic and sediment materials, and decreases potential for channelization and loss of fine material (Jackson and Strum 2002).

In general the assessments indicate that the major perennial streams within the analysis area are stable and contain abundant amounts of woody debris that dissipates flow energy and provides stream bank stabilization (see the existing condition section), with the exception of the lower reach in Papoose Creek which indicated moderate stability. This is mainly due to bank disturbance caused by cattle grazing near the lower Papoose Creek riparian zone in the warm summer months (mostly on private lands but some does occur on Forest Service lands as well). Removing two culverts through road decommissioning within this watershed may help to reduce future sedimentation but would not change the existing conditions regarding bank disturbance from grazing.

With the continued protection of the RHCAs the stream channels in the project area would likely remain stable and inherently resilient and would continue to provide for beneficial uses by maintaining good water quality and protected Riparian Management Objectives RMO’s.

Appreciable degradation of any stream channels resulting in water resource damage or reduced water quality within the project area due to increased water yield/peak flows is not expected. Canopy reduction levels given the proposed action would likely not change to the degree in which measurable changes in peak flows or water yield would occur. Potential changes or fluctuations in water yields or peak flows in the prescription watersheds not expected to affect stream channels or water quality. That is due to the overall stable conditions and geomorphological characteristics indicating stable and resilient stream channels, and to the resilient stream channel types and stream channels consisting of practically no low gradient stream channels (i.e., < 2% slope) consisting of fine materials. Rain on snow (ROS) events and resulting peak flows are natural processes in the area and play a role in the overall morphology and stability of stream channels in the area. Grant and others (2008) found that in ROS-dominated landscapes peak flow effects on channels, when they occur, are confined to reaches where the channel gradient is less than 2% and streambed and banks are composed of gravels and finer materials. No management caused canopy openings have occurred within the project area since 1996 with most occurring 30 to 40 years ago.

Therefore water yields and or peak flows are likely to occur near levels commensurate with natural ranges.

BMP and PACFISH/INFISH buffers are expected to further protect instream conditions from timber harvest. Therefore, there would be no expected negative effects on overall stream channel conditions and/or water quality within the project area from timber harvest activities.

Summary

Direct Effects

There would be no direct effects to ESA listed aquatic habitat or species as a result of the proposed harvest and prescribed burning for the Windy Shingle project since there are no designated critical fish habitat within the harvest units. Cutthroat habitat is found adjacent to 1 harvest unit in upper Squaw Creek but direct effects to this species is not expected due to the maintenance of PACFISH buffers. There are no mechanisms for sediment generated from harvest or prescribed burning activities to directly impact fish bearing streams as a result. In addition, all streams would be buffered thus retaining all riparian trees and vegetation, dead and alive, within PACFISH buffers. Stream temperatures would not be altered as a result of the proposed action due to buffer retention.

Indirect Effects

Sediment increases in project area streams are expected to be undetectable as a result of all project activities. BMP's, Design elements and PACFISH buffers almost eliminates the potential for sediment movement downhill. Retention of buffers, live and dead trees, downed woody debris, and ground based vegetation throughout the units provides structures that would capture sediment and minimize it from moving down the slope.

Personal observations (K. Smith) of completed regeneration harvest units containing PACFISH buffers on the Clearwater National Forest between 2000 and 2013 show that buffers prevent sediment from reaching streams. Local monitoring of 23 miles of buffers and 5.5 miles of temporary road after timber harvest and burning of the units was also completed on the Lochsa District of the Forest in 2014 (USDA Forest Service, unpublished data). There was no evidence of sediment moving from harvest units into buffers or sediment moving from temporary roads into harvest units or buffers. Retaining downed woody debris within the harvest units provides structures that capture sediment and slow or stop its movement down the slope. The monitoring included harvest units with hillslope gradients ranging from 10 to 60% with an average of 35%.

The use of roads for log hauling are not expected to generate measurable amounts of sediment in streams as there are very few stream crossings on the road to be used for haul. In addition, timing restrictions would be applied limiting haul to conditions that would not cause erosion as well as the fact that the roads are graveled which reduces the risk and amount of sediment delivered to streams. Cross drain culverts that divert roadside ditch flow onto the forest floor and away from streams are also in place or would be installed prior to log haul.

Cumulative Effects

The Windy Shingle project has been designed to have no measurable effect to sediment input to streams; therefore the combination of past, present and foreseeable activities and/or environmental changes would produce no cumulative effect to sediment, riparian areas or aquatics habitats within and beyond the project area boundary.

The temporal bounds are 1-5 years after activity (conservatively) for sort term effects as sediment movement from ground disturbing activities is only likely to occur within this timeframe. Ground vegetation and its sediment trapping capabilities generally recover after that period of time.

There would be no effects to sediment from past timber harvest activities since none has occurred in the project area for over 21 years. This is well outside of the cumulative effects timeframe.

No discernible cumulative effects to instream sediment are expected from the Windy Shingle Project when combined with the past and reasonably foreseeable projects since the Windy Shingle Project is not expected to add measurable amount of sediment to streams.

The cumulative effects analysis is conducted on the project area watersheds only: Squaw Creek and its tributaries including Papoose Creek; Shingle Creek and its tributaries; the section of the Rapid River that falls within the project area; and Indian Creek and adjacent small face drainages. Any scale larger than this would dilute the effects of the project to non-measurable amounts.

Sediment effects are expected to last no more than two years from project implementation due to revegetation of the disturbed sites within that timeframe. An additional two years was may be an expected amount of time it would take for shrubs and ground cover to respond after the last of the decommissioning activities occur. Local monitoring shows the growth of shrubs and other ground cover limits overland flow of sediment within this timeframe. No diminishing effects to aquatic habitat is expected from temporary road obliteration, which may up to three years after the vegetation treatment is completed, as these areas are not hydrologically connected to perennial streams.

There are no current 303(d) listings and/or TMDL's for the project area streams. All streams within the project area are considered to be fully supporting beneficial uses. This condition would likely remain unchanged over the long term with the continued maintenance of RHCAs.

Road Building/Management

Cumulatively, the ongoing effects associated with roads include potential sediment delivery from road surface erosion when combined with inadequate drainage, and potential road fill failures where culverts have not been replaced to accommodate a 100-year flow event. There are approximately 65 stream crossings (including intermittent streams) on roads within the project area. Road maintenance and improvements are designed to keep roads in optimum conditions for travel as well provide for adequate drainage and surfacing to protect the road from excessive and unwanted surface or ditchline erosion. Road are generally graveled and should receive regular maintenance in order to alleviate road erosion and subsequent sediment delivery problems. Road position and surfacing greatly reduces the risk of sediment delivery to streams. Project area roads are mostly located on or near ridgetops and have relatively few stream crossings, or are graveled which helps to minimize their contributions of sediments or other contaminants to streams. A study by Swift (1984) showed that placement of crushed rock reduced sediment production by 70 percent from the unsurfaced condition. All of the prescription watersheds (other than Indian Creek) are drained by cool, clean water from relatively unroaded headwaters that fall within an Idaho Roadless Rule "back county restoration designated area".

Road stabilization to minimize runoff from roads would also occur with this project (installation of armored drivable dips, waterbars, and culvert removal). The culvert replacements would create short-term (1 day each) increases in sediment during installation activities. This would help to cumulatively improve water quality as there would be long term benefits to streams through the reduction of road related sediment and the risk of culvert plugging and failure.

The existing project area road density is 1.48 mi/mi^2; rated low density. Within the Riparian Habitat Conservation Area(s) (RHCA), the density is .098 mi/ mi^2; which equates to a relatively low density. There are approximately 21 perennial and 44 intermittent road/stream crossings within the project area. This project would remove 15 intermittent culverts that would reduce sedimentation long term. This would help to cumulatively improve water quality as there would be long term benefits to streams through the reduction of road related sediment, runoff, erosion and the risk of culvert plugging and failure.

Past road access management has contributed watershed and water quality improvement through road use restrictions that limit access to roads particularly during the wet fall and spring seasons when sediment is most likely to be delivered to streams. Approximately 15 miles of road combined within the prescription watersheds have been closed to limit motorized traffic over the past 20 years and about 28 miles have been closed in the entire project area project area. The restriction of motorized use to either year round or seasonal use, has likely contributed to a positive cumulative effect to sediment.

Past, Present and Foreseeable Timber Harvest

No man caused canopy openings from harvest has occurred within the project area since 1996 with most occurring 30 to 40 years ago. Water yields are likely within natural ranges as no evidence of channel changes were evident during field surveys. There would be no effects to sediment from past timber harvest activities since none has occurred in the project area since 1996 and all areas are now well vegetated.

Streamside buffers are designed to eliminate or reduce sediment delivery to streams from timber harvest activities and to maintain the components necessary to maintain and improve aquatic habitats (i.e., wood, sediment, bank stability, shade). Buffers appear to have been retained adjacent to harvest units from the 1960s through 1996 (prior to PACFISH requirements). Imagery (Google Earth) shows most streams except for some very small headwater areas retained buffers of 50 feet or wider. The buffers were generally 150 feet or wider on mainstem streams. Buffers retained after 1995 were 150 feet wide on perennial non-fish bearing streams and 300 feet on fish bearing streams as per PACFISH standards. Recent buffer monitoring on the Clearwater National Forest showed no delivery of sediment to either the buffer or to streams after harvest and burning treatments (Smith, K. 2016, unpublished report).

Other Cumulative Effects Factors

Past, present and ongoing effects to streams in the lower reaches may also be a result of grazing activities which has caused some stream bank erosion and disturbance. However grazing does not appear to be causing substantial amounts of sediment to streams overall within the project area (see existing conditions). This existing situation will likely continue in the future but is not expected to cause substantial amounts of sediment to streams overall given the current levels (no increase) of grazing are expected to be maintained.

There are no other future foreseeable projects that overlap the Windy Shingle project in terms of cumulative effects to fish habitat in the analysis area.

The effects to stream sediment cumulatively and as modeled by NEZSED are expected to be minimal which indicates a 5-17% increase in sediment yield to depending on applicable “prescription watershed”.

No discernable cumulative effects to instream sediment are expected from the Windy Shingle Project when combined with the past and reasonably foreseeable projects since the Windy Shingle Project is not expected to add measurable amount of sediment to streams.

There are no discernible cumulative effects from road decommissioning or road improvement since no other similar projects have occurred in the watersheds in recent years. Road maintenance should be conducted in the future (beyond this project) which maintains the roads in a good condition and limits the effects of potential road surface erosion. Road maintenance, including graveling, would continue on this road.

It is expected that water quality and fish habitat conditions would not be negatively impacted. Long term positive cumulative effects from road improvement, decommissioning, and access restriction activities would be expected from the reduced potential sediment input into streams.

NEZSED Cumulative Results

Timber harvest and temporary road construction in analysis area are not likely to contribute to negative cumulative sediment effects due to streamside buffer retention and temporary road location. Although NEZSED model results showed some increases in sediment yield, most are associated with roads, the results show that sediment would not rise above Forest Plan standards for sediment yield in the applicable prescription watersheds. Sediment increases in project area streams are expected to be undiscernible as a result of vegetation treatment activities given the design elements and effectively implemented BMPs. Retention of buffers, live and dead trees, downed woody debris, and ground based vegetation throughout the units provides structures that would capture sediment and minimize it from moving down the slope as noted from past motoring.

The use of roads for log hauling are not expected to generate measurable amounts of sediment in streams as dust abatement during log haul, proposed improvement/maintenance treatments and operational limitations which reduces the risk and amount of erosion (rutting) and sediment delivered to streams. A 1993 study by Sanders and Addo showed that dust abatement produced half the amount or less of dust as untreated graveled roads. They also showed that traffic speeds affect the amount of dust produced. Slower traffic speeds (20–30 mph) produce half as much dust as higher speeds (40+ mph). Log haul traffic speed is not expected to exceed 30 mph and would be closer to 20 mph due to this narrow section of road.

Analysis Summary

The Windy Shingle project is not expected to have adverse effects on ESA-listed species or their habitat, or Regional Forester designated sensitive species due to the fact that only minimal and likely undiscernible sedimentation potential expected.

Currently no streams within the project area are 303(d) listed for sediment or temperature concerns and no sediment or temperature TMDL's exist for the project area streams. All streams within the project area would continue to fully support beneficial uses.

No new permanent road construction would occur with this project. Temporary roads are located on hydrologically benign areas (ridgetops or near ridgetops) and would not cross any springs, intermittent or live perennial streams. All temporary roads would be decommissioned within three years following the completion of the vegetation treatments. Proposed road work and road decommissioning would improve water quality by reducing potential for erosion and sedimentation to streams over the long term when compared to existing condition.

Proposed vegetation management operations inherently have the potential to create erosion on hillslopes as a result of soil disturbance caused by yarding activities. Hillslope erosion can result in fine sediment delivery to streams if there are no barriers or structures in the hillslope to intercept the flowing water and sediment. This in turn can result in negative effects on aquatic habitats through the filling of the interstitial spaces in fish spawning and rearing gravels. Deeply embedded spawning gravels can suffocate eggs and larvae resulting in poor fish survival. Embedded substrates (cobbles, gravels) also limit the amount of habitat available for juvenile and resident fish who occupy areas under and around these substrates during the winter months. Good quality spawning and rearing habitats are particularly important for maintaining and/or improving ESA-listed or sensitive aquatic species populations. This project would use an array of previously discuses (table 3) design elements and/or BMPs which have been shown to be highly effective in minimizing potential soil damage and reduce potential for erosion from harvest activities such as skidding.

The potential effects to water quality and aquatic habitats from sediment movement from proposed vegetation treatment is expected to be minimal due primarily to; the location of harvest and prescribed burning units which are mostly on or near ridgetops; PACFISH buffer retention which greatly reduces potential for sediment movement to streams; retention of downed, coarse woody debris within the harvest units (reduces potential for erosion within and out unit); BMP implementation; and operational limitations (such as halting harvest operations to prevent soil damage during wet periods). The retention of downed wood within the which can trap sediment moving downslope, greatly reduces the potential for sediment delivery to streams. The relatively low amount of intermittent and perennial streams adjacent to harvest units also minimizes the likelihood of harvest related erosion reaching streams. Design elements and other site-specific BMPs have been shown to mitigate the potential for sediment delivery to the aquatic ecosystem. Past monitoring efforts on the forests, going back to the late 1980s, have shown that the BMP program on forest has a relatively high success rate of proper implementation and effectiveness. Additionally, third party water quality audits by the Idaho Department of Lands have shown a high implementation compliance rate (~99%) for timber sale projects on National Forest System Lands in Idaho, including the Nez Perce Clearwater National Forest. In addition to the design criteria and BMPs that will be applied, it is anticipated that road maintenance activities associated with the project will provide further benefits to the existing condition for aquatic resources by reducing sediment delivery from roads (See the detailed explanation of these treatments in above). Implementation of PACFISH buffers, BMPs and design elements will maintain or enhance existing conditions of the riparian areas and stream habitat, indicating channel stability and resiliency over time within most stream reaches. The predicted sediment yield increase from modeling for all applicable prescription watersheds are well below Forest Plan standards.

None of the planned vegetation treatment units are directly adjacent to stream reaches containing critical habitat for listed ESA fish species. Stream reaches containing cutthroat trout would be buffered by at least 300 feet (as is the case in Shingle Creek). All other stream reaches directly adjacent to or in near proximity to the proposed vegetation treatment units are either non-fish bearing or does not contain critical habitat for listed fish species. The closes harvest unit to designated critical habitat is approximately .5 miles which is found in squaw creek. This unit is a ridge top unit and not directly hydrologically connected to squaw creek. Table 11, shows the proximity of harvest units to designated critical habitat within the project area. The majority of the harvest and/or temporary road construction activity would occur 2-4 miles from ESA listed species critical habitat (map 1, table 11).

Downstream of the project activity areas and generally outside of the project area ESA listed species or critical habitat and R1 sensitive cutthroat trout are either mapped or have been documented in Squaw Creek (a tributary to the Little Salmon River) and Shingle Creek (a tributary to the Rapid River). Indian Creek in a non-fish stream because it has minimal habitat due to high stream gradients. No fish have been documented in Papoose Creek, which goes dry in several reaches during summer months, and the reach found on Forest Service land is considered to be a “No Fishery” (Appendix A of the Forest Plan) based on the fact that the stream goes subservice and is intermittent. Papoose Creek is mapped as having about 1.8 miles of ESA-listed critical habitat for steelhead and spring chinook which is located outside and downstream the project area on private land.

Table 11. Species and Proximity of Activity to Nearest Known Occupied Habitat, or Nearest Potential Occupied Habitat, for ESA Listed Species and Existing Cobble Embeddedness

Stream Name	ESA Species	Miles of DCH in Drainage (miles)	Minimum Distance to DCH from Vegetation Treatment or Temp Road Construction Activity (miles)	Cobble Embeddedness (%)
Squaw Creek	STH/Spring CH	~8	0.5	17% (2016) (Meets Forest Plan)
Papoose Creek	STH	~1.5	0.8	No Data*
Shingle Creek	STH/Spring CH	~1.8	1.0	15% (2016) (Meets Forest Plan)
Little Salmon River (indirectly connected to the project activities by small ephemeral face drainages)	STH/Spring CH/BT	All	1.0	No data (outside project area)
Rapid River	STH/Spring CH/BT	All	2.5	No data (meets Forest Plan)

STH = Steelhead, CH = Spring Chinook, BT = Bull Trout, DCH = Designated Critical Habitat, * = Non- Applicable Forest Plan Prescription Watershed

Log haul within the project area would not cause water quality to be appreciably reduced given the limited amount of live stream crossings (see table 6) and hydrologically connections along routes and the use of BMPs such as haul on well pre maintained roads and operational limitations such as road closures and haul suspension during wet periods and/or storm events which would reduce potential for sedimentation caused by log haul. Streams along haul routes are mostly over 100ft from the roads (table 6). Riparian areas adjacent to log haul routes are mostly well vegetated with conifers and/or shrubs acting a sediment buffer. Dust abatement will be required as a BMP and log haul would occur during dry or frozen conditions with most occurring between the months of June and September greatly minimizing potential for erosion and sedimentation.

Available science supports the general conclusions that reduced canopy cover in a forested system can change the dynamics of water availability through deposition of snowfall, snow accumulation and melt rates, reduced canopy interception of precipitation, and reduced evapotranspiration rates (Grant et al 2008). Though the effects are confounded by changes in stand density that may have decreased water availability over historic levels, and many other complex physical environmental variables. Typical concerns about increases in water yield are founded in theoretical changes in aquatic habitat and channel morphology. Despite the interest this issue has garnered, to date no field studies have explicitly linked peak flow increases with changes in channel morphology (Grant et al 2008).

Recent Past harvest (forest canopy openings) in the project area were greatly limited with past harvest occurring roughly between 1966 and 1996. There are no known areas where past riparian harvest has occurred.

Grant and others (2008) determined 20-30% canopy removal in some watershed is the threshold to be significant enough to show measurable increases in water yield, based on a review of numerous research efforts across the northwest. None of the prescription watershed in the project area would exceed these canopy opening thresholds with the planned vegetation treatments. As previously discussed, Grant et al. (2008) found that peak flow effects on channels are generally confined to reaches where the channel gradient is less than 2% and streambed and banks are composed of gravels and finer materials. Stream channels or channel reaches within the treatment areas with channel gradients less than 2%, and made up of fine materials are limited, based on field reviews (see existing condition section).

V. DETERMINATION OF EFFECTS

ESA Listed Fish Species - Determinations

Table 12. Determination of Effect for ESA Listed and Sensitive Fish Species

Species	Determination
Snake River Steelhead Trout	May Affect, Not Likely to Adversely Affect Snake River Steelhead Trout or Their Designated Critical Habitat
Snake River Spring/Summer Chinook Salmon	May Affect, Not Likely To Adversely Affect Snake River Spring/Summer Chinook Salmon or Their Designated Critical Habitat
Snake River Fall Chinook Salmon	No Effect
Snake River Sockeye Salmon	No Effect
Bull Trout	No Effect

ESA Listed Species Effects Determination Conclusions:

The Windy Shingle Project **would have No Effect on Snake River fall Chinook salmon and Snake River sockeye salmon**, **and/or their designated critical habitat**,

- Because of the limited scope and location of this project in relation to the Little Salmon River and the Lower Salmon River, any local minor increases in sediment yield are not expected to be routed downstream to these rivers or designated critical habitat areas for Snake River fall Chinook salmon and Snake River sockeye salmon.

The Windy Shingle Project **may affect, but not likely to adversely affect Snake River spring/summer Chinook salmon critical habitat**.

- Effects from the vegetation management treatments and other project activities are expected to be minimal at most (see section IV). Effects to Spring/Summer Chinook salmon critical habitat, if any, are expected to be indiscernible. Based on the protective design elements, BMPs as well as the scope and location of the proposed vegetation treatment activities in relation to the nearest designated critical habitat (table 11), no discernible adverse effects to spring/summer Chinook salmon critical habitat are expected. PACFISH buffers and other sediment negating techniques would vastly negate potential for impacts to fish habitat and/or water quality.

The Windy Shingle Project **may affect, but not likely to adversely affect** the threatened **Snake River steelhead trout and designated steelhead trout critical habitat**.

- Effects from the vegetation management treatments and other project activities are expected to be minimal at most (see section IV). Effects to Snake River steelhead trout critical habitat, if any, are expected to be indiscernible. Based on the protective design elements, BMPs as well as the scope and location of the proposed vegetation treatment activities in relation to the nearest designated critical habitat (table 11), no discernible adverse effects to Snake River steelhead trout is expected. PACFISH buffers and other sediment negating techniques would vastly negate potential for impacts to fish habitat and/or water quality.

Essential Fish Habitat (EFH) – Magnuson Stevens Act

Essential Fish Habitat has been designated in for Chinook salmon in the near the project area which equates to the same stream reaches as the designated critical habitat for Chinook salmon.

Direct and indirect effects of the proposed action, such as increased sediment and in-channel work, are expected to have only short-term non-appreciable effects to water quality and therefore on the Chinook salmon EFH in the Squaw Creek and Shingle drainage although harvest and temporary road building activities are at least .5 miles away from EFH in Squaw Creek and at least 1 mile away in Shingle Creek. The projects would not affect large woody debris recruitment, stream temperature, or other PACFISH RMOs as riparian area would be protected. This conclusion is based on implementation of PACFISH, project design elements and BMPs, and proximity of the projects to the nearest EFH.

Therefore the Windy Shingle Project ***may affect, but not likely adversely affect*** **Chinook salmon EFH** in Squaw Creek and Shingle Creek. Project generated effects to salmon habitat would likely be unmeasurable within Squaw Creek and Shingle Creek and would not be measurable to the Chinook salmon EFH beyond Squaw Creek and Shingle Creek due to the distance from the project area and the dilution effect. The rationale for this determination is further based on the effects analysis above.

Columbia River Bull Trout Designated Critical Habitat

The determination for Columbia River bull trout designated critical habitat is **No Effect**. No bull trout critical habitat exists within the project area. Streams in the project area are small, have relatively steep stream gradients, and very few pools. The project would not affect bull trout designated critical habitat in the Little Salmon River which is 1-5 miles away from the project areas harvest, temporary road building and road decommission activities. No vegetation treatment, log haul or road management would occur within close proximity to the Rapid River. The nearest activity to the mapped bull trout critical habitat in the Rapid River is approximately 2 miles away. The implementation of required BMP's and design elements which includes PACFISH buffers and other sediment negating techniques would further eliminate potential for downstream impacts.

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